RAILROAD GAZETTE

FRIDAY, MARCH 14, 1902.

CONTENTS

Contributions

Slag Ballast.

Southern Railway Company. }
Chattanooga, Tenn., Feb. 24, 1902. }

TO THE EDITOR OF THE RAILROAD GAZETTE.

In reply to a communication from "W," in your issue of Feb. 21, in regard to slag ballast, will say that I have had considerable experience in handling slag ballast for the past eight years.

In my opinion, the best method for unloading and handling slag until under the ties is as follows: Load in double hopper bottom coal cars, opening the drop bottom just enough to allow the slag to come out in the quantities required, moving the cars slowly enough to allow the track to be filled by one going over. Attach a "drag" or plow to the last car, allowing it to rest on the rails, which will level the slag even with the top of the rail, or below if necessary, by dapping the drag where it comes in contact with the rail.

The minimum depth to be placed under the ties should be about 8 in. to give the best results; however, in some cases where traffic is light, 6 in. will do. Slag behaves well in bad cuts if a light coat of cinder is first put in. Of course, I think it is generally admitted that slag ballast is not so good as stone. However, it can be worked more rapidly and costs considerably less.

A good day's work for trackmen surfacing slag is 17 ft. per man, putting track in good line and surface.

Slag should be loaded with a steam shovel, the dipper to contain about a yard and three-quarters to two yards, and it can be loaded for about 5 or 5½ cents per yard; weighs about 2,700 lbs. per cu. yd., and about 24 yards can be loaded in a 60,000-lb. capacity coal car. In loading slag with a steam shovel, the slag in the pile should be loosened up by powder, so that the steam shovel will handle it readily. A small steam drill, either a No. 4 or No. 6, should be used; a large long-stroke drill will jar the slag and fill the hole behind the drill; red clay mortar dropped in behind the drill will serve as a preventive to slag dropping in behind the drill. One ordinary pump boiler will run two or three drills.

We use the tamping pick in putting slag under the ties. Of course, the slag pulverizes under the pick more or less. On account of acids contained in slag ballast, ties will not last as long in slag as they will in stone.

J. A. DODSON, *General Superintendent.*

Committee Work in the Engineering and Maintenance of Way Association.

Weissnichtwo, March 10, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

Is the "standing committee" plan of work adopted by the American Railway Engineering and Maintenance of Way Association the best that could be followed, or are there not other plans which would produce surer and better results? This is a very important matter for this young and aggressive organization to give serious attention to. The facts are, that while much has been attempted during the three years of the Association's life, so far there has been but little accomplished in the way of unifying or standardizing the specifications and requirements of the departments of railroad service which this organization includes.

Committees made up of men widely scattered over the country, each one of whom is generally pressed quite to his limit with the work he is obliged to attend to for his own company, cannot accomplish much in the way of concerted action. In one of the cases that has come to my attention, a sub-committee of three was so scattered, that the location of these members would form an isosceles triangle, having a base of 900 miles and two sides of 600 miles each. The three men have never met face to face, and each one has at this time, a heavy burden of work upon him. Nearly a year ago they were lined up by the one who was designated chairman, and since that first "circular letter" a considerable amount of correspondence has passed between them on the subject they had in hand. Finally, by some giving and taking among themselves, they presented to the general committee, consisting of nearly a dozen widely scattered men, their proposed recommendations for criticism or approval. The approval was forthcoming from the majority of the committee, for it takes less time to approve than to dissent. However, a few dissented, and gave their ground for dissenting in more or less fullness. This resulted in the whole matter going the rounds again, and some who had at first approved the original recommendations, decided that they had been too hasty, and instead of harmony of action, individuality of opinion developed as the time for presenting a final report drew to a close. Had it been possible to get this large and unwieldy committee together in a general conference, it is probable that in a couple of hours they would have threshed out their differences and been able to present a valuable recommendation to the general convention.

It would seem that if the committee plan is to be followed in the future, the committees should be limited to a few members each with but one subject to report upon, and that these few, say three members, should be so selected that they could easily meet each other at frequent intervals during the year. They would then be able to gather data together and digest them and carry on such correspondence with the members as would enable them to keep in touch with all of those especially interested and affected by the subject they were dealing with. They could be counted upon to have a report to present that would have some definite value to it.

There is one other point that should be seriously considered, and that is, how to insure that those appointed upon committees, will serve the Association as they would their employers or clients. Each appointee on a committee of this important organization, should consider it a high honor to hold the position, and should not accept appointments except with the understanding that it will cost him time and labor in return. There should be a requirement that each committee should meet at least once a month for at least one hour and as many more hours as may be necessary to transact its business. Any member who is unable to attend such meetings should not serve on a committee. After the members of a committee have accepted appointment, attendance upon committee meetings should be compulsory. Absence from two consecutive monthly meetings of his committee, of which timely notice had been given, should be sufficient ground for the dropping of such absentee from the roll of the committee, unless his colleagues specifically excused the absentee on good and sufficient grounds. A record should be kept by the Secretary of the Association of the attendance and proceedings of all committees, such record to be furnished to the Secretary by the chairmen of the several committees.

The suggestions above outlined would tend to crystallize the work of the Association, which is likely to become so loosely diffused under the existing plan of procedure, as to lose in a large measure its usefulness to the railroad profession.

HUGO.

"Solon" and His Critics.

Chicago, March 7, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

We notice in the *Railroad Gazette* of Feb. 14 an article headed "A New York Central Defect," and signed "Solon." The signature itself would seem sufficient evidence of the arrogance of the writer. In this case Solon evidently has it in for the New York Central management. For this we do not care so much, but when, in order to injure a corporation, the attempt is made through an attack upon the personality of such men as the one referred to in said article, it is but proper that it should have some notice from those acquaintances of years past who know his character, his ability and his work.

Solon says, "he has no detailed and professional knowledge of block signals, interlocking, electricity, properties of steam," and so on, and so on. Does this gentleman realize that for 27 years this man of whom he writes has been active in nearly all the various departments of the western railroad that holds the fastest long distance record that has ever been made, a road that has been able in mail competition to win every time for years? Does he realize that in passing through these positions it has been his duty to have such a knowledge of detail in all the departments as to make the road in each department as successful as only a master hand could do? There probably is no man in this country who has a more definite knowledge of the working detail of all the various departments of railroad work than this gentleman.

Further than that, there is no better place for education than the building up of a railroad from the early days of its history, and in such a field this gentleman spent his last 27 years. And it may be assumed that there is no better evidence that he mastered these details in the past, and hence must have become thoroughly educated in his work and master of the situation, than the fact that the railroad world readily recognizes that from the early beginning of 27 years ago to the present time every department of which this gentleman has had practical charge, has become as nearly perfect as the same department in any railroad in the United States. We predict for this new manager the same great success in the future that he has had in the past. We can ask nothing better.

F.

New York, March 9, 1902.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I was much interested in the two communications which have appeared in late numbers of the *Railroad Gazette*, one entitled: "A New York Central Defect," and the other "The Engineer and the Administrator." In the former article the contention is that the civil engineer is the proper man to manage a railroad, while in the latter it is denied.

In a discussion of this kind one cardinal fact seems to be overlooked, and that is that the Chief Engineer of a railroad is not a co-ordinate official, but instead a subordinate employee; or, to use a simile, instead of being a cabinet officer, he is only a department head.

It is very questionable whether a civil engineer should be placed in charge of the operating department, or act as general manager, or hold an equally responsible position of this kind, perhaps for no other reason than that he lacks experience in that direction. The province of the chief engineer, it seems to me, is to build, to construct the railroad, and when in operation, supervise its maintenance and study out improvements, especially in cases where mistakes have been made in its original location, of which there are many examples.

After the track is laid it is usually assumed that there is no more use for the chief engineer and his services are dispensed with. Previous to this there was but one department, namely, that of engineering. Up to this time the chief engineer has reigned supreme, and he was literally monarch of all he surveyed. With the laying of the track (I do not say the completion of the railroad) things begin to change. The railroad was built as a business enterprise, the people that invested their money expect to see some of it back, and to accomplish this desideratum, certain purposes must be carried out. To do this successfully various departments must be organized, chief of which is the operating department. It might appear that the man who was competent to construct the railroad would be the proper person also to operate it. This may be the theoretical view, but it is not borne out by the actual conditions. I venture the assertion that the chief engineers that have attained responsible positions in the actual management of a railroad can be counted on the fingers of one hand. Why this is so I hardly pretend to say, except perhaps the scientific training and studious habits do not fit him for a place of this kind, and that his natural sphere is construction, rather than operation. If this is not true, why do we find so many men, who have worked their way up from brakemen, firemen, enginemen, conductors, telegraph operators, clerks and what not else, filling the responsible positions in a railroad? I do not say that a civil engineer would fail to possess these same qualifications as well as the other class of employees named, but the kind of work that he does on a railroad does not seem to fit him for it.

A. B. C.

TO THE EDITOR OF THE RAILROAD GAZETTE.

I thank you for the opportunity to read some comments on my letter to you. It is not uncommon for readers to skim hastily through the discussion of a general principle and find in it only a single personal application. The subject of the Feb. 14 letter was written near its beginning as follows:

"The attitude of the directors of the road toward the technical departments, and also their idea of service and promotion for merit."

The splendid, able Vice-President and General Manager was not criticized and needs no defense, but allow me to repeat: "On the New York Central the scientific man does not belong. Not a member of its board of directors, not a general officer, except of the engineering departments, is an engineer, and surprisingly few among them are educated men." Your correspondents do not attempt to controvert this statement or to deny the inevitable results of control by a board without knowledge of railroading.

The happenings of the past fortnight are indicative: Two of the directors call upon the Mayor of New York to make humiliating promises to him in order to induce him to aid in modifying hostile legislation at Albany. The Mayor, a trained business man, asks them to put it in writing, and an undignified appeal for mercy is delivered to him signed by a "majority of the Board!" Imagine this solemn discussion of one of the most difficult transportation problems on one of the greatest railroads in the world by worthy gentlemen who do not know the difference between a train order and a requisi-

tion, who could not for their lives differentiate the offices of a semaphore and a bridge tickler!

The lack of dignity in this incident is not unimportant. Hasty and unjust critics, among whom have been the Mayor and the District Attorney, are encouraged by it, and we may reasonably expect that they and the public officers of other communities along the line will plainly see and use their power to put the directors "on the run" whenever the inevitable accidents in railroading occur.

The sum of it is that ignorant control, lack of backbone and hopelessness among under officers of promotion for merit are the causes for the present hatred of the public and lack of loyalty among the officers and employees. SOLON.

The Miller Locomotive Cab Signal.

To the Editor of the Railroad Gazette.

A seeker after information has read with a great deal of interest the article published on page 128, of the issue of Feb. 21, on the subject of the Miller locomotive cab signal. The S. A. I. confesses that he is not clear on some points, nor could he find an explanation of them in the article; but as they no doubt have been considered by the promoters he begs to state a few of his difficulties and seeks to have them removed.

The article says: "The current from the roadside battery runs first to a rail of the track, thence to a wheel of the locomotive, thence to the engine apparatus, thence by a wire to the tender, which is insulated from the engine, and through the tender wheels and another section of track back to the roadside battery." Does this not mean that for convenience the front wheels of the engine would be used, and does it not follow that this pair of wheels must be insulated from the truck or engine and from the boiler? Considering the weight carried on the wheels of modern engines is this not rather a difficult proposition? Again, on a suburban engine, where there are no engine trucks and the tank is carried on the engine frame, how would the insulation between the front driving wheels and the tender be arranged in such a case? It is to be presumed that such insulation has been effected, but has it proved a practical and effective method and what are its details? Mention is made further on that the tender is insulated from the engine by raw-hide. It is not clear to the writer just how this is done even at considerable expense, and it seems that while the difficulty might not be insurmountable it would be a very expensive process both in first cost and in maintenance.

A weak point would appear to be the short section of track which is insulated for the purpose of changing the cab signal, according to the condition of the block. The engine is supposed to make the connection with the insulated section, but if the rails of this insulated section happen to be covered over with sand, thus preventing the engine from making proper contact with these insulated rails, would not the result be that the engine would continue with the same light displayed regardless of the condition of the block?

Mention is made of the battery power for the cab lights being carried on the engine. Will not the motion of the engine prevent this battery from doing its duty properly? The writer thinks it will, from the fact that he has had considerable experience in the use of wet batteries for annunciators in passenger cars and has found them very undesirable for the purpose, so much so that he is now using dry batteries. As these, however, are designed for open circuit work only it does not appear to him that they would be satisfactory when used for closed circuit work, such as would be used when lighting the cab signal. The idea of using the power furnished from a headlight dynamo would seem a more feasible plan, providing all went well. Of course a failure of the headlight dynamo would mean that the engine would have neither headlight nor cab signals and would have to proceed without or against signals; and as we all know, the oftener trainmen and enginemen are permitted to disregard a red or danger signal the less regard they have for the signals; consequently it is only a matter of time until the signals will be of doubtful value.

In diagrams Nos. 1 and 2 instruments are suggested for the purpose of allowing the engineer to test the signal when it shows white, in order to ascertain whether it is really a bona fide white signal. If, after a test has been made, the engineer finds that as a result of such test he now has a red signal shown in place of the former white one, will he not have to continue to the next block against a danger signal in his engine cab?

Relays designed for track circuit purposes are necessarily very sensitive, owing to the current used in the track section being very light. I have a case in mind where the box containing the track relay was put on the side of a river bridge. The vibration of the bridge caused by a passing train closed the contact of the relay, with the result that the circuit of the signal battery was closed and a clear signal given while a train was in the block. Might not this happen with the relay in the cab of the engine for the "Miller" signal, thus giving a false signal to the engineer? The relay carried in the cab of the engine will certainly be subjected to very rough usage, owing to the movement of the engine.

It would be interesting to know what provision is made for side tracks. Is it understood that all side tracks are to be equipped with track circuit instruments, so that the engineer will know the condition of those tracks on entering them? What arrangements are made for engines passing over long crossovers or railroad crossings?

Experience has shown that the fireman on a modern locomotive has about all that he can attend to in putting in coal, one shovelful at a time, and has not much time to be looking after lights and signals. If this view is correct, is not the engineer the only one of the train crew who knows anything about the position of the blocks? Should an engine meet with an accident, and have its cab smashed, what indication, if any, would there be to show whether the engine at the time of the accident was running with a red or a white light in the cab?

This letter is not intended in any way as a criticism of the Miller signal apparatus, but merely sets forth some points which occurred to the writer on reading the article, and which seemed to require elucidation. A system of this kind naturally excites interest and comment among railroad men, and there has been not a little criticism of the scheme by engineers and others who are operating trains under a block system. Many of the points overheard during discussions by the operating committee around the roundhouse stove and in the bunk room anteroom, are embodied with others in this letter. S. A. I.

Work of the Past Year in and Around Chicago.

Much work of special interest to maintenance of way officers has been done in Chicago and vicinity during the past year by many of the roads entering the city, large sums having been spent in improvements. The largest and most important undertaking and one that has affected nearly all roads, either directly or indirectly, is the elevation of tracks in compliance with city ordinances. This work is well under way on many of the lines, sufficiently so to give an idea of its magnitude, and of the difficulties involved. Wherever yards are within the limits prescribed by the elevation ordinances, these yards have been, or are to be, raised along with other portions of the line. In order to give a better idea of the extent of the undertaking involved in this track elevation scheme, we have prepared a table giving the miles of track elevated, the number of grade crossings eliminated, the number of subways built, and the estimated cost of the work, as made by the department of track elevation of the City of Chicago, and covered by ordinances to date. Some of this work has been completed, some is under way, while some has not yet been begun.

The building improvements include freight houses and suburban passenger stations; other stations and buildings are under way, among which is a fine new passenger terminal. A number of good-sized interlocking plants have been installed, and yards and terminals have been enlarged. The most important and interesting work reported by the individual roads follows:

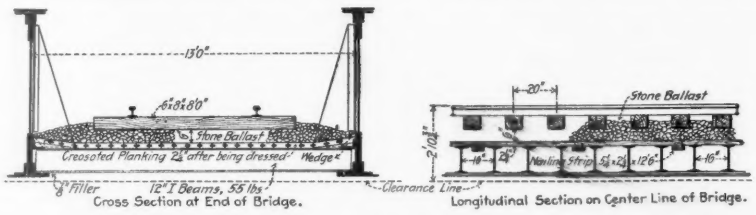
Atchison, Topeka & Santa Fe and Chicago & Alton.—The Atchison, Topeka & Santa Fe has devoted its attention principally to track elevation, being jointly concerned with the Chicago & Alton and the Illinois Central's Chicago, Madison & Northern line. The work is practically completed from Halsted to Lock street. A novel and interesting feature in connection with this work is in the floor design of the bridges over subways, an illustration of which we show herewith. The flooring is of creosoted planking, instead of the usual steel plates, which latter require that periodically the stone ballast must be dug out and the metal painted to prevent corrosion.

In addition to this work, the Chicago & Alton has installed at its Brighton Park roundhouse a small direct-current electric lighting plant for lighting the roundhouse and car yards and for furnishing current to a storage battery plant to be used for charging the limited trains. The improvements at this point also include the installation of a small machine shop in the roundhouse, the erection of a good-sized ice house, and the contemplated construction of a concrete-lined drop pit, having a portable air-operated jack, for use in the car yards. Also the main line from Chicago to Mazonia, about 62 miles, is being equipped with Hall automatic, electric block signals.

Chicago & Western Indiana.—The tracks and passenger terminal of the Chicago & Western Indiana are used by the Chicago & Erie; Chicago & Eastern Illinois; Chicago, Indianapolis & Louisville; Grand Trunk, and Wabash roads. The Chicago & Western Indiana is engaged on track elevation and has the concrete retaining walls in place from Forty-ninth street to Seventy-third street. An old iron bridge on its belt line, over the Chicago, Burlington & Quincy tracks, has been replaced with one of steel construction, costing $14,000. A small interlocking plant, by the Standard Signal Co., having a 14-lever tower, has been installed at 112th street for controlling a junction of two portions of the company's line.

The freight yards and terminals of the Chicago & Erie are at present quite crowded and in order to handle its business without serious interference, when elevation of these tracks and yards is begun, the company is making plans for an outside yard. The engineering department is at the present time principally concerned in the reduction of grades and increasing the terminal facilities of the road.

The Chicago & Eastern Illinois has recently com-



Chicago Track Elevation—Floor Design for Subway Bridges, A., T. & S. F., C. & A., and C., M. & N. Joint Track.

TABLE OF TRACK ELEVATION—CITY OF CHICAGO.

	Track. First Main. Miles.	Track. Total. Miles.	Subways.	Grade Cross'gs Eliminated.	Estimated Cost.	
Atchison, Topeka & Santa Fe	5.0	11.43	21	21	709,500	18th St. to So. Kedzie Ave.
Chicago & Alton	4.52	22.10	32	39	1,000,000	15th St. to California Ave.
Chicago & North Western:						
Chicago Avenue Division	3.00	29.80	25	32	1,200,000	Chicago Ave. to Diversey Blvd.
Galena Division	4.75	39.99	16	16	1,100,000	Ada St. to 40th Ave.
Wisconsin Division	4.50	15.78	27	32	1,000,000	Wood St. to 44th Court.
Milwaukee Division	4.50	11.85	21	28	900,000	Wrightwood Ave. to Bryn Mawr Ave.
Rockwell Street Division	19.25	106.26	110	19	600,000	Ogden Ave. to Fulton St.
Mayfair Branch	4.79	15.63	17	17	843,000	Kinzie St. to Irving Park Blvd.
Total Chicago & North Western	19.25	106.26	110	129	5,030,000	
Chicago & Western Indiana	9.57	68.68	63	63	2,211,000	22d St. to 73 St. Jackson Blvd. to Grand Ave.
Chicago, Burlington & Quincy	2.30	9.46	17	24	500,000	Western Ave. to City Limits.
Chicago Junction	1.75	3.00	11	11	345,000	Ill. & Mich. Canal to 40th St. Wallace St. to Green St.
Chicago, Milwaukee & St. Paul	11.90	58.42	54	63	3,195,000	Western Ave. to Montrose Blvd. Ellston Ave. to Marshfield Ave. Kimbell Ave. to 51st Ave.
Chicago, Rock Island & Pacific	7.10	51.26	47	54	2,300,000	Van Buren St. to 78th St.
Chicago Terminal Transfer	5.90	11.62	35	35	1,200,000	42d Ave. to C. & N. W. Ry. Ill. & Mich. Canal to 52d St. Irving Park Blvd. to 52d Ave. Ogden Ave. to California St.
Grand Trunk	2.75	.....	27	27	.....	Western Ave. to Green St.
Illinois Central:						
Main Line	3.00	28.70	13	17	2,000,000	47th St. to 71st St.
Chicago, Madison & Northern	5.61	10.07	21	21	699,500	18th St. to St. Louis Ave.
St. Charles Air Line	1.60	4.66	9	10	.....	I. C. R. R. to Stewart Ave.
Total Illinois Central	10.21	43.43	43	48	.....	
Lake Shore & Michigan Southern	7.80	64.97	42	43	2,900,000	Van Buren St. to 75th St.
Pittsb'gh, Cincin'ti, Chicago & St. Louis						
Main Line	2.75	2.94	14	14	*343,000	Ill. & Mich. Canal to 52d St.
Rockwell Street Line	3.80	18.72	28	28	1,000,000	Ogden Ave. to Ada St.
Englewood Branch	0.70	1.18	6	6	300,000	P. F. W. & C. R. R. to Green St.
Total P., C., C. & St. L.	5.75	22.84	42	42	1,643,000	
Pittsburgh, Ft. Wayne & Chicago	8.7	79.26	56	58	2,775,000	22d St. to 75th St.
Grand Total	108.59	567.04	622	679	$27,295,500	

*Partial estimate.

TRACK DEPRESSION.

			Viaducts.			
Atchison, Topeka & Santa Fe	0.40	2.50	1	...	.....	15th St. to 18th St.
Chicago & Western Indiana	0.40	3.77	1	...	.....	15th St. to 18th St.
Chicago Junction	.30	0.61	...	...	.....	Under L. S. & M. S. and I. C. tracks.
Illinois Central	5.75	81.90	8	...	.....	Randolph St. to 47th St.

pleted entire new yards at Dolton, near the southern limits of the city, with a capacity for 3,500 cars. In connection with the yards is a new roundhouse, projected for 40 stalls, 20 of which have been built, the remaining 20 to be added at some future time. The building is of brick and is heated by the Sturtevant system. A 70-ft. turntable was also put in. Two Taylor electric interlocking plants have been installed at Chicago Heights at the Michigan Central and Elgin, Joliet & Eastern crossings.

Chicago, Burlington & Quincy.—The Chicago, Burlington & Quincy has built a handsome suburban station, subway and waiting rooms at Riverside. The material is brick, and the total cost was $40,000, that of the building being $32,000. This station is quite complete, and is considered a model of its kind. Also a small suburban station has been built at Stone avenue, La Grange, of brick and stone. A steel viaduct has been put up at Canal street to carry the street over the tracks. In order better to handle the traffic to and from the suburban yards at Riverside a 36-lever interlocking plant was put in, the Union Switch & Signal Company's apparatus being used. The road has under consideration at present the elevation of its tracks from Halsted street west to Western avenue.

Chicago, Milwaukee & St. Paul.—The Chicago, Milwaukee & St. Paul is putting in an experimental Rowell-Potter signal system between Pacific Junction and Edgebrook. It also has under way the installation of a steel counter-balanced, swing drawbridge over Ogden Canal, and known as the Goose Island drawbridge, an illustration of which is shown. The bridge has a clear span of 120 ft. and a minimum overhead clearance of 23 ft. It will be seen that the counterweight, which is of concrete Twelfth street to enable the company to use this station. A 40-stall brick roundhouse has been built at Forty-seventh street and a new turntable put in. It is expected to drive this table with an electric motor at a later date. A one-story dock house, 40 ft. x 400 ft., and built of brick, has been put up on the Calumet River, near 106th street. The road has placed a large 300,000-lb. Riehle testing machine in the Forty-seventh street shops. The most important topic under consideration by the engineering department is the rearrangement of the yards, in connection with the building of the new terminal passenger station, and the elevation of the tracks.

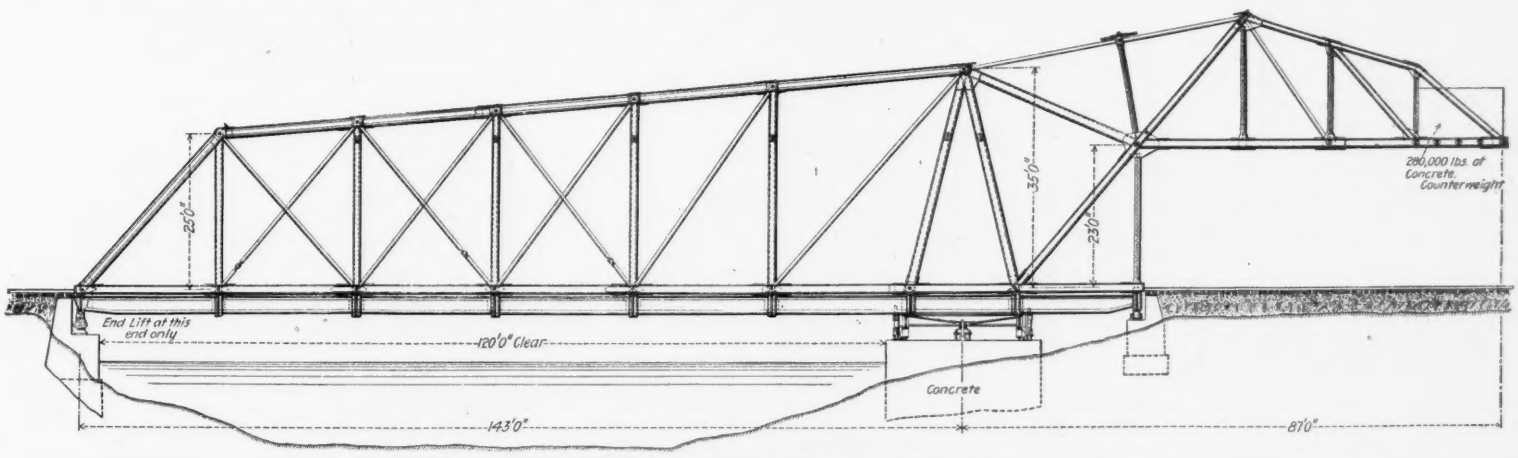
Chicago Terminal Transfer.—The Baltimore & Ohio, the Chicago Great Western and the New York, Chicago & St. Louis use the Chicago Terminal Transfer's passenger terminal. The Chicago Terminal Transfer has relaid eight miles of its main line in the city with 80-lb. rails, A. S. C. E. section. A new Scherzer rolling lift bridge has been built across the Chicago River just south of Taylor street, by the Sanitary District of Chicago, to carry the tracks of the C. T. T. over the river. It is a double-track structure with a clear span of 275 ft., constructed on the cantilever principle. A low-pressure, pneumatic interlocking plant has been installed by the Standard Signal Co. at West Twelfth and Rockwell streets, where the C. T. T. tracks cross the Panhandle and Chicago & North Western. There is also being installed a similar plant in the main terminal yard at the Grand Central passenger station. A McHenry mechanical coaling station, built by Fairbanks, Morse & Co., Chicago, has recently been completed at Fourteenth and Robey streets. It has 40-ton pockets and is operated by a gasoline engine, which engine also operates a gravity sand plant in connection with the coaling station.

ern Illinois at Chicago Heights was referred to in connection with the latter road.

Pennsylvania Lines.—The Chicago Terminal Division of the Pennsylvania Lines West of Pittsburgh includes the Pittsburgh, Fort Wayne & Chicago from Clark Junction to Chicago, 224 miles; Pittsburgh, Cincinnati, Chicago & St. Louis, Bernice to Chicago, 26 miles; South Chicago & Southern, Colehour to Hammond, 9.3 miles; State Line & Indiana City, East Chicago to Clark Junction, 6.5 miles; Calumet River R. R., South Chicago to Hegewisch (on east side of Grand Calumet River), 4.4 miles; Calumet Western, South Chicago to Hegewisch (on west side of river), 5 miles; Englewood Connecting R. R., between P., F. W. & C. and P., C., C. & St. L., on Fifty-ninth street, 2.4 miles.

The Calumet & Western, completed during the past year, has 3.4 miles of double track. There has been an increase in sidings on the P., C., C. & St. L. of 11,314 ft.; on the S. C. & S., of 2,042 ft.; on the E. C. R. R., of 641 ft.; a total of 13,997 ft., or 2.65 miles. A new double-track drawbridge, 226.5 ft. long, was put in on the Calumet Western over the Calumet River. A new double-track swing bridge, 108 ft. long, was built on the P., C., C. & St. L., over Mud Lake, near Twenty-sixth street. A four-track Scherzer rolling lift bridge was installed by the Trustees of the Sanitary District of Chicago to carry the P., C., C. & St. L. over the Drainage Canal. The most important matter now under consideration by the engineering department is that of track elevation.

Chicago Junction.—The Chicago Junction reports some miscellaneous work in the way of yard improvements and track work, but nothing of any particular importance. Considerable work is laid out for the coming season, the most important of which is track elevation. It is in-



Goose Island Draw Bridge—Chicago, Milwaukee & St. Paul Railroad.

and weighs 280,000 lbs., is placed overhead, the object being to avoid interference with the docks. The end-lifting and turning machinery are operated by a 30-h.p. electric motor. The bridge is carried on a massive concrete foundation and its weight, exclusive of the counterweight, is 430,000 lbs. The steel work is being furnished by the Wisconsin Bridge & Iron Co. The road has in contemplation for the coming year a large amount of track elevation work, and the removal of the freight terminals and transfer house at Western avenue to Galewood.

Chicago, Rock Island & Pacific.—The Chicago, Rock Island & Pacific has laid about a mile of switching tracks for its elevator and dock house at 106th street, and an additional 2,000 ft. at its new freight house at Taylor and Sherman streets. The tracks at Blue Island, where junctions with the Chicago Terminal Transfer and the Grand Trunk Western occur, have been raised to eliminate grade crossings. The elevation includes about one-and-a-quarter miles of double track, and there are three double-track, deck-girder bridges. One over Stony Creek, 93 ft. long; one over Western avenue, 90 ft. long, in two spans; and one over Broadway, 116 ft. long, in four spans. There is also a double-track, through-girder, thin-floor bridge, 36 ft. long, over the Chicago Terminal Transfer tracks; and a double-track, deck and through-girder bridge over the Grand Trunk.

At Sixteenth street, where the crossing of the Rock Island and the Lake Shore roads with the St. Charles Air Line and the Chicago, Madison & Northern occurs, a Taylor "all-electric" interlocking plant has been installed, one of the largest of its kind in the country. A full description of this plant was published in the *Railroad Gazette* of July 12, 1901. Another similar plant was put in at Englewood at the crossing of the South Chicago branch and the main line, and the junction of the suburban line with the South Chicago branch.

The new freight house at Taylor and Sherman streets, referred to above, is of brick, 48 ft. x 486 ft., with two stories and a basement, and cost $62,000. A new passenger station, erected jointly with the Lake Shore at Thirty-first street, is two stories high, of brick, and cost $26,000. It has the baggage and waiting rooms on the second floor, which is at the level of the track elevation. The splendid new terminal passenger station that the Rock Island and Lake Shore have begun work on is described elsewhere in this number. While this station is being built these roads are using the Grand Central Station on Harrison street and this necessitated a rearrangement of the Rock Island yards in the neighborhood of

The only work of importance reported by the Baltimore & Ohio is the completion of a storage yard south of the city, having a capacity for 350 cars. The engineering department has under consideration the rearrangement of the freight terminals to give increased facilities.

Illinois Central.—The Illinois Central passenger terminal and tracks are also used by the Cleveland, Cincinnati, Chicago & St. Louis; the Michigan Central, and the Wisconsin Central. The Illinois Central has built a double-deck freight house on Randolph street for the use of the Wisconsin Central, with the necessary storage and team tracks in connection. The building is three stories high, 396 ft. long and 77 ft. 3 in. wide. It is designed for six stories, the three additional stories to be built when necessary. The foundation is of concrete on piling, and the frame work of steel. The walls, with the exception of the first story on the east side, which is brick, are of hollow tile. The second story is reached by a viaduct on the east side, and all inbound freight is delivered from this floor, outbound freight being received on the first floor. The Illinois Central has also made substantial additions to its elevator "B," near the Chicago River. The Taylor electric interlocking plant at Sixteenth and Clark streets, in which the Illinois Central is interested, has been referred to in connection with the Rock Island.

A new alternating current, electric lighting system, with power station located near Twenty-sixth street, and intended to furnish light for buildings, stations and yards from Randolph street to Dauphin Park, was described in our issue of Feb. 14. The territory served extends 11 miles along the line and includes 22 suburban stations, the main passenger station at Twelfth street, the South Water street and Wisconsin Central freight depots, and yards in the vicinity of the power station and at Fordham. The company is also experimenting with the use of electricity for switch lights wherever practicable, and has a number of switches around the main passenger station so lighted.

A system of automatic, electric block signals has been installed on the line for 56 miles south of Chicago, from Kensington to Kankakee, giving a complete block signal service for this portion of the road. An important matter now before the engineering department is the proposed elevation of the tracks at Grand Crossing.

The Michigan Central reports no new work or improvements in the vicinity of Chicago worthy of mention during the past year. The Taylor electric interlocking plant installed at the junction with the Chicago & East-

tended to elevate on Campbell avenue, between the Illinois and Michigan Canal and Thirty-ninth street, the work being done jointly with the Pittsburgh, Chincinnati, Chicago & St. Louis and the Chicago Terminal Transfer. It will eliminate six grade crossings by subways, one of which, Western avenue boulevard, will be crossed at an angle making a structure 550 ft. long. The tracks south of the stock yards will also be elevated from Forty-ninth street north over Forty-seventh street, reaching grade about 1,500 ft. north of Forty-seventh street. Fifteen tracks will be carried over Forty-seventh street on a ballasted steel viaduct, making a subway about 1,100 ft. long. The estimated cost of this improvement is $150,000. In connection with this elevation the Forty-seventh street yards will be enlarged to double their present capacity. Some of the yards in the packing-house district are to be enlarged, and the one at Ashland avenue will be extended. An interlocking plant will be put in at the connection with the Chicago Terminal Transfer at Blue Island.

Metal Crossties in Russia.

Although the railroad mileage in the Russian Empire has doubled in the last decade, there will be when the lines now under construction are completed, a total of less than 40,000 miles of road. Under conditions of light traffic and moderate speeds these roads have been able to get along with rather indifferent equipment, light rails, small wooden ties and poor roadbeds.

Metal ties have been introduced in several instances in an experimental way, but have sooner or later been abandoned.

With a view to improving the condition of the roads the Russian Government acting through the Bureau of Transportation, instructed the higher railroad authorities to take up for consideration the question whether it were practicable to use metal ties on Russian railroads. Conferences of the railroad officials were recently held at the Bureau of Transportation which were attended by two representatives of the Minister of Finance, and at which much doubt was expressed as to the success of metal ties on Russian railroads because of the generally poor roadbeds and the severe climatic conditions of the country. But as the result of these conferences it was recommended,

First, to ascertain as nearly as possible to what extent metal ties in Russia have stood the test of service.

Second, that engineers be sent to foreign countries to

study the merits of approved types of metal tie, and ascertain why the use of such ties in Western Europe is not more extended, and why their use on certain roads has been abandoned.

Third, that these investigations be made also in Russia, and that for experimental purposes, metal ties be supplied to railroads for equipping longer stretches of track. These experiments should not be regarded from a purely economical point of view, as the result will be important in itself, not only for the railroads, but also for the development of the iron industry of the country.

New Mill for Re-rolling Worn Rails.

A new mill for re-rolling worn rails is now building at Tremley Point, N. J., and will be completed about the first of May. This makes the third mill owned by the American McKenna Process Co., the re-organized company working under the original patents granted to Mr. E. W. McKenna. Mr. Howard Morris, Milwaukee, Wis., is the President of this company; Mr. Julian L. Yale, Rookery Building, Chicago, is Vice-President, and Mr. D. H. Lentz is General Superintendent. A general plan of the new Tremley Point mill is shown in the accompanying engravings and also a plan of the mill lay out.

Mr. McKenna, about 1891, while Assistant General Superintendent of the Chicago, Milwaukee & St. Paul, conceived the idea of re-rolling worn rails, removing irregularities due to wear or other causes, and turning out a rail of the same height but otherwise of somewhat smaller cross-section. The present system of re-rolling was devised in 1892. Machinery was built and installed in the North Chicago Rolling Mill, which was leased for a short time from the Illinois Steel Works, and about 3,500 tons of rails were re-rolled for experimental use. This mill, and the first work done, was fully described in our issues of Aug. 2 and Aug. 16, 1895. It is hardly worth while to review these experiments in detail, but the first rails rolled gave good results in a severe service test.

A re-rolling mill with two heating furnaces was started at Joliet, Ill., in 1897 and was built to have a capacity of 150 tons a day, but this capacity has since been increased by improvements up to about 220 tons a day single turn, or 410 tons double turn. The following year, 1898, a similar mill and of the same capacity was started in Kansas City, Kan., and up to the present time these two mills have turned out between 125,000 and 130,000 tons of re-rolled rails. The Tremley Point plant will have three heating furnaces instead of two and will have a capacity of about 330 tons of rails, single turn, of 12 hours, or 600 tons double turn. Naturally a number of improvements have been made in the new mill as the result of experience at Joliet and Kansas City, and the situation of the new plant in the East and on tide-water will extend the operations of the company to a new field.

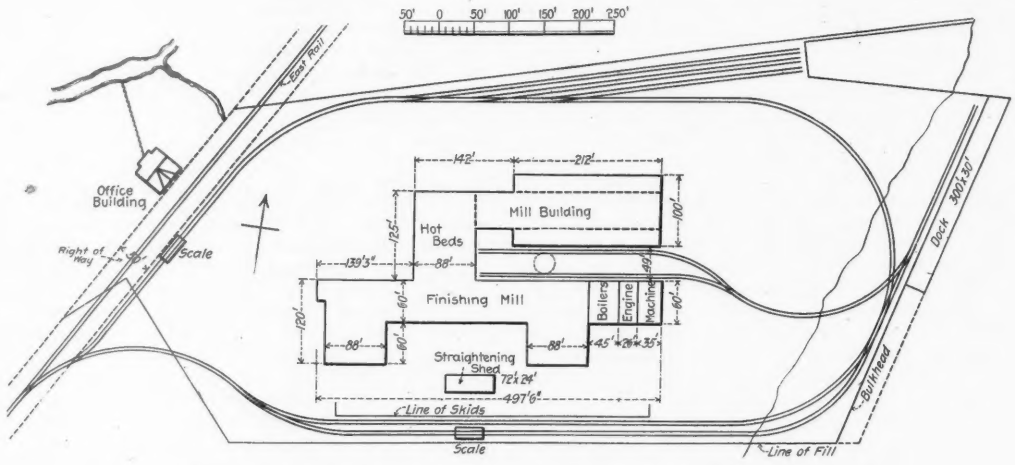
Up to now the company has made a practice of receiving a particular lot of rails from a railroad, renewing them and then returning the same rails to the road which sent them. For this work a charge of from $5 to $6 a ton has been made. While this practice will doubtless be continued in the case of roads near the mills, yet it is the intention to proceed in the future on somewhat broader lines. Worn rails will be bought by the company, re-rolled and sold to railroads the same as new rails are now sold. This will open up a larger market for re-rolled rails and increase the number of possible customers. Outside of this the policy of the re-organized company will probably remain the same as in the past. Nothing has developed which seems to warrant any change in the mechanical or metallurgical processes, as the results given by the renewed rails in service have been satisfactory.

The Tremley Point plant is at Warner's Station on the Sound Shore branch of the Central Railroad of New Jersey. It is four miles southeast of Elizabethport, on the Arthur Kill, near the mouth of the Rahway River. This gives good facilities for transportation by water and eventually there is to be a big slip built, as outlined in the general lay-out, northeast of the mill. Railroad ferries will land loaded cars there and also receive shipments in cars. The company has 33 acres of land and the buildings, of modern structural steel with galvanized steel roofs and sides, have about 77,000 sq. ft. of floor surface.

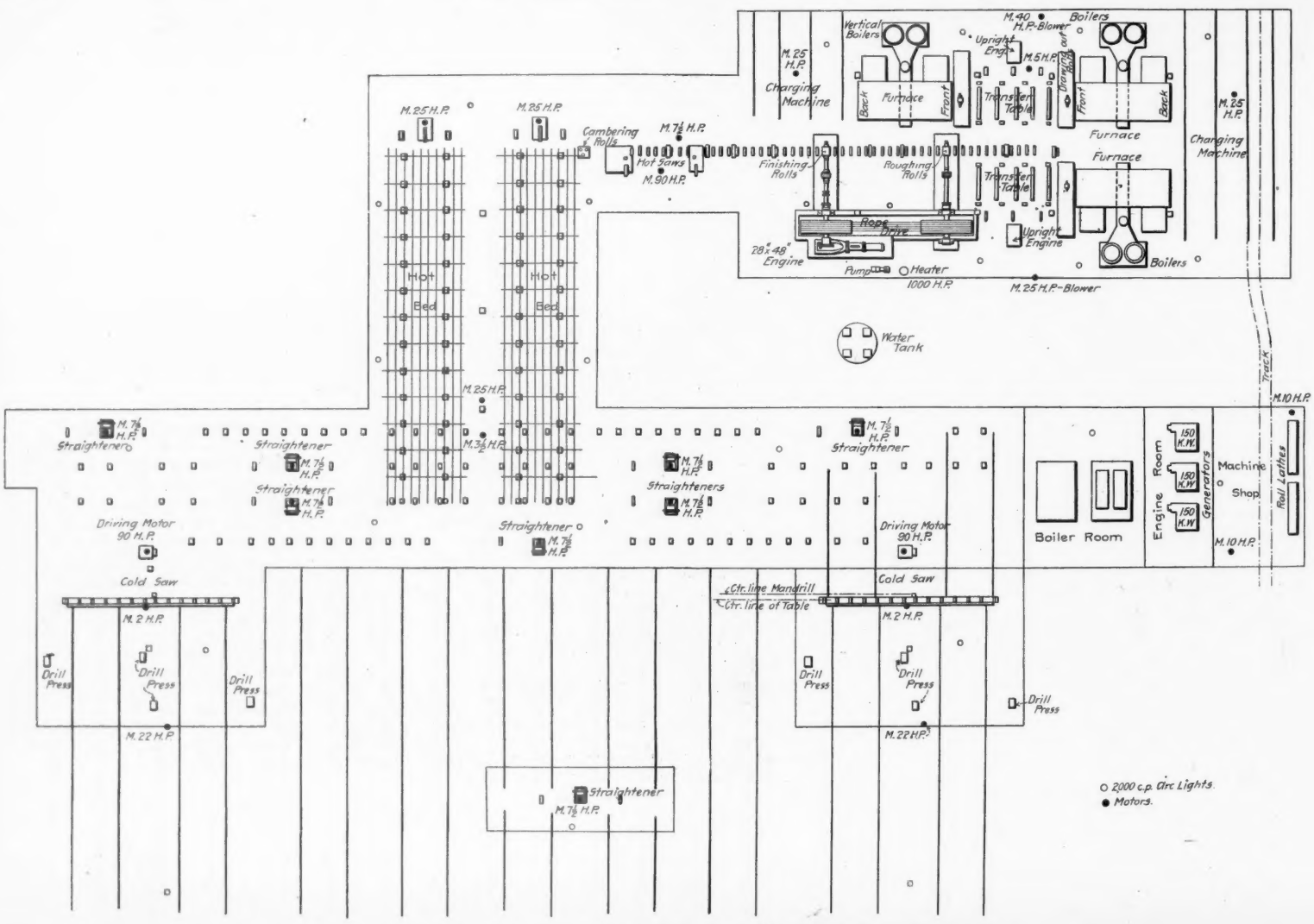
The contract for dredging the waterway, filling the marshy site, putting in all foundations, and putting up the buildings was given to Messrs. Milliken Brothers, of New York, and work on the plant began last July. The contractors filled about 200,000 cu. yds., built about 700 ft. of bulkheads and 300 ft. of docks, and drove piles 40 ft. to bedrock as a base for all foundations for buildings and machinery. The piles are driven as close together as possible, cut off below low water line and capped with concrete foundations, no grillage being used. The buildings are now complete, except putting on some of the sheet-steel coverings. Milliken Brothers also built the runways for the main traveling crane, and have furnished the general lay-out of the plant, which is given herewith.

The relation of the several departments and the general dimensions of each are shown in the illustrations; also the apportionment of individual motors, and the arrangement of boilers, engines, generators, roll trains and rope-drive. Two hot-beds are shown and there will be room for another train of rolls when needed. A new feature indicated near the hot-beds is the cambering machine, three small rolls, set vertically, between which the finished rail is properly cambered for cooling, on its way to the hot-bed. This cambering was formerly done by hand, as in the older processes of rail-making.

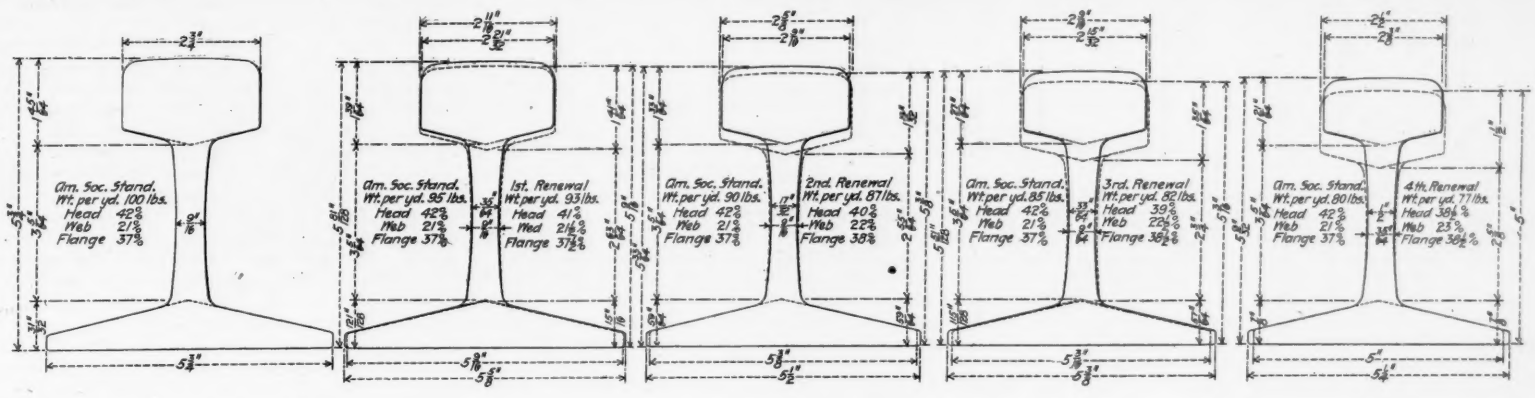
The outside dimensions of the furnaces are 36 ft. 6 in. x 14 ft. 3 in. and inside they are 35 ft. x 12 ft. There are two charging machines, in general like the one shown in the half-tone illustration, and each machine is driven by a 25-h.p. motor. One machine will charge two furnaces and, for the present, the other machine will charge but one furnace. The waste heat will be used to generate



General Layout of Plant at Tremley Point, N. J.—American McKenna Process Co.



General Plan of Equipment—Tremley Point Plant of the American McKenna Process Co.



Renewing an Am. Soc. C. E. Standard 100-Lb. Rail Four Times.

NOTE.—*The Standard Sections are Shown in Dotted Lines; Renewed Sections Full Lines.*

After Renewing.
Weight, 60 lbs. per yd.
Length, 32 ft.

Before Renewing.
Original Weight, 70 lbs. per yd.
Length, 30 ft.
Weight when received, 66.51 lbs. per yd.

After Renewing.
Weight, 49 lbs. per yd.
Length, 32 ft.

Before Renewing.
Original Wt., 60 lbs. per yd.
Length, 30 ft.
Wt. when rec'd, 57.03 lbs. per yd.

Sections of Worn and Renewed Rails—Examples of Rerolling by the McKenna Process.

steam in two vertical, Hyde, tubular boilers at each furnace. Each of these boilers is of 200 h.p., making 1,200 h.p. to be generated from waste heat. This will be the main steam supply for all purposes. There is an auxiliary battery of two Heggie Brothers' horizontal flue boilers, 100 h.p. each, in the boiler room, and provision is made for another battery of the same capacity. These boilers are hand-fired with soft coal.

There are three Harrisburg engines direct-connected to three 150-k.w. Milwaukee generators; each generator having a capacity of 250 amperes at 250 volts. The main rolling-mill engine is a horizontal Corliss, 28 x 48 in., made by the Frick Co., Waynesboro, Pa. It drives the roughing rolls by rope transmission and the finishing rolls by direct connection to the shaft. There are also two vertical engines of 150 h.p. each to operate the transfer tables and the drawing-out rolls in front of the furnaces.

Process.—Only a brief description of the McKenna process will be given now as it has already been described in considerable detail (Aug. 2 and 16, 1895). Rails brought to the works are first unloaded and sorted as to height, curve wear and flowed heads, each kind being kept separate. Rails having flowed heads are taken to a specially designed grinding machine and the fins are ground off. In passing a rail through this machine the emery wheels are brought up against the rails and grind the head along one side. If there are fins on both sides of the head the rail is turned end for end and given another pass. The grinding machine at Tremley Point is driven by a 75-h.p. motor, and it takes about 1½ minutes to grind a rail.

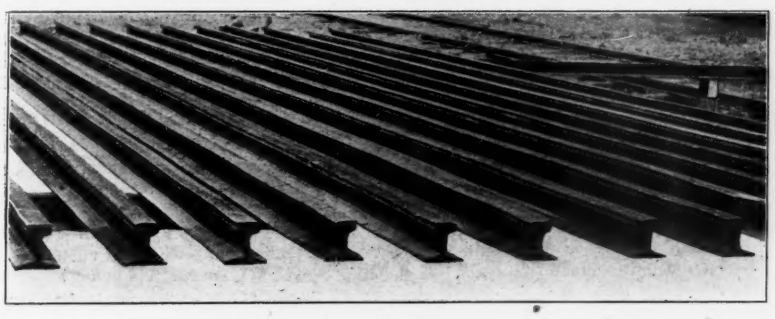
Each of the three furnaces at Tremley Point takes an average charge of 20 rails, the number depending upon the section. The charging machine will take a group of six or seven rails from the table alongside and run them into the rear of the furnace. The furnaces are of the reverberatory type, have two firing chambers, one at each end, and are fired with soft coal. Blast is furnished by two Buffalo Forge fans, direct-driven by one 25-h.p. motor and one of 40 h.p.

Possibly it is not too much to say that the success of this process depends more upon this heating furnace than upon any other one thing. The difficulties in heating uniformly a 30-ft. rail, owing to the unequal distribution of the metal, can readily be imagined, and the present furnace is the result of much study and experiment, and is fully protected by patents. The flanges of the rails rest on a brick floor and the furnace is so formed that the heat impinges directly from the roof on the heads of the rails. This, and the effect of the floor in retarding the heating of the flanges, causes the heads to be heated at about the same rate as the webs and flanges. The heating is very uniform and under perfect control.

Robert W. Hunt & Co. about a year ago made temperature observations with a pyrometer at the Joliet works with the following results: As drawn from the furnace, the rails average a little below 1,800 deg. F. On the transfer table, just before passing to the leading rolls, the average temperature is about 1,700 deg. F. When leaving the finishing rolls, the average is about 1,480 deg., and on the hot-bed, after being sawed and passed through the cambering rolls, the average temperature is about 1,200 deg. These observations show that in the McKenna process the temperatures are considerably lower than in usual rail mill practice.

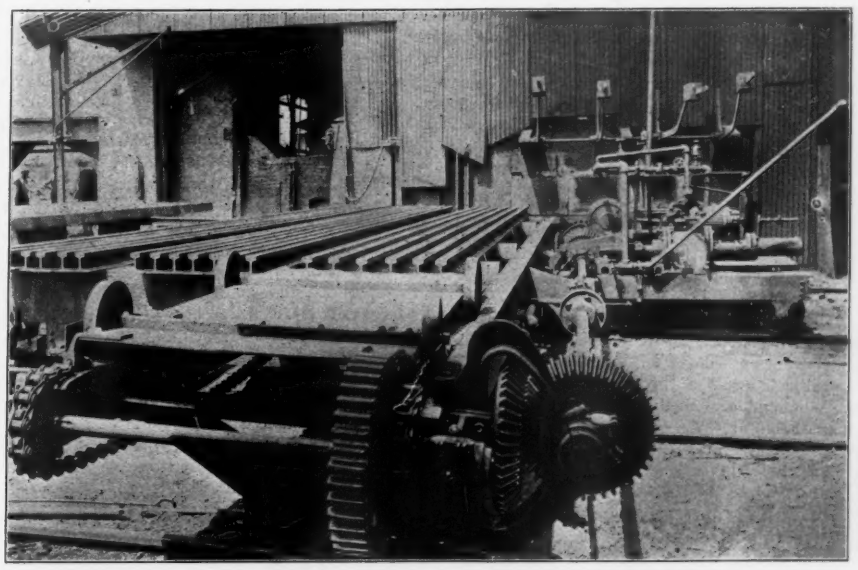
After heating, for about 30 minutes, the rails are taken from the furnace at the end opposite the charging machine. A hook is first inserted in one of the old bolt holes, and the rail is drawn out by a set of drawing-out rolls mounted on a carriage that travels the width of the furnace-front, and by a set of feed-rolls, which, with the traversing arrangement constitute the transfer table. The traversing arrangement consists of three small buggies operated by wire ropes and sheaves, driven by a 5-h.p. motor. These buggies carry the rail across the transfer table and deliver it on the feed-rollers of the roughing train. The rail passes through two sets of two-high rolls, roughing and finishing, respectively, receiving but two passes in total. It should be noted here that as the rail is drawn from the furnace the scale is removed from it by the pressure of the drawing-out rolls, and also by the use of some water spray.

Delivery to the hot-saws from the finishing rolls is



75-lb. Rails Before Treatment by the McKenna Process.

The Same Rails After Treatment by the McKenna Process.



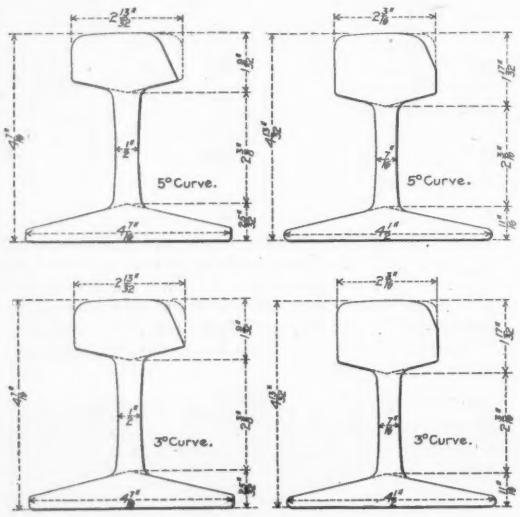
McKenna Furnace Charging Machine—Joliet Mill.

direct, and these saws and the cambering rolls are driven by a 90-h.p. motor. Beyond this, the process is like that of ordinary rail making. Eight straightening presses are driven by a 7½-h.p. motor each, and two sets of drills, four in each set, are driven from line shafting belted to a 22-h.p. motor. The cold saws are toothless, 52 in. in diam., and are run at about 1,700 r.p.m. by a 90-h.p. belted motor. Hydraulic power shifts the rail carriages at the hot and cold saws.

The machine and blacksmith shops are suitably equipped for roll-turning and other repairs. The entire rolling-mill department is served by a 10-ton electric traveling crane, built by the Case Manufacturing Co., Columbus, Ohio, and a 5-ton crane serves the machine shops. Mr. George Langford, Superintendent of the Tremley Point plant, has helped us much in getting this special information.

It will readily be seen that a special set of rolls is required for each different section of rails and much skill is shown in laying out these rolls. Some examples of the changes made in renewing old rails are shown by the accompanying engravings. Rails varying from 56 to 80 lbs. per yard have so far been renewed and on an average the furnace loss and loss by crop ends amounts to about 8 per cent., and from a 30-ft. rail, if desired by the railroad, either a 31 or a 32-ft. rail can be made.

How a 100-lb. rail of Am. Soc. C. E. section can be renewed four times and make a good section each time is shown here as a matter of interest, and because it is



Am. Soc. C. E. Standard. New Steel Rolled and Laid, 1897; Wt., 65 lbs. per yd.

Renewed. Re-rolled and Laid, 1897. Original, 71 lbs.; renewed, 65 lbs. per yd.

Comparative Wear of New and Renewed Steel Rails on Curves.

suggestive. The several sections produced in re-rolling have been worked out with a great deal of care with all the data.

Judging from the fractures and the known effects of working steel as in the McKenna process the opinion has been generally accepted that re-rolling makes the rails tougher, more elastic and better able to resist wear. There is now available some information about rails in service which verifies this opinion. The accompanying engravings show the wear of new Am. Soc. C. E. rails and of renewed rails of the same weight, all laid in 1897 on the same division of a Western road and subject to the same traffic conditions. The sections selected for illustration here are of rails on curves and the greater wear of the new rails is apparent. It may be well to say that the renewed rails were rolled from an old-style section having a very thin web originally, so that nearly all the work had to be done without any reduction in that portion of the rail.

New Construction and Maintenance on the Big Four.

The Chief Engineer of the Cleveland, Cincinnati, Chicago & St. Louis sends us a memorandum of work recently done on that system:

During 1901 18,000 tons of 80-lb. rail was used for main line renewals, and the best of the rail released was used for renewals on side lines.

A new coaling station of the bucket elevator type has just been completed at Cincinnati and a similar one is under construction at Columbus, Ohio.

A passenger station at Wabash, Ind., to cost $20,000, and one at Muncie, to cost about the same, are under construction. Freight house and tracks at Cincinnati have been completed at a cost of $30,000. Contracts for passenger stations at Shelby, Ohio, and Lebanon, Indiana, have been let.

A double-track bridge of the Scherzer rolling lift pattern was completed over Cuyahoga River at a cost of $100,000, in addition to which 12 structures were built or contracted for, aggregating in weight 1,550,000 lbs., mostly heavy plate girder work. This included a single track viaduct 430 ft. long, having a maximum height of 70 ft. All the new bridge work is designed for two consolidation locomotives, having 60,000 lbs. on each driving axle and weighing, with their tender, 204 tons each, followed by 5,000 lbs. per ft.

During 1901 there were erected on this system 59 structures of concrete masonry, containing a total of 16,125 cu. yds. of concrete. Since Jan. 1, 1899, this road has replaced 304 structures of wood (9,567 lineal ft.) with permanent structures of stone or metal.

Freight terminal yards have been enlarged and remodeled at Linndale, containing 40,404 lineal ft. of new track, Columbus 9,859 lineal ft. of new track, and at several other points during the last year.

The main lines of the Cleveland, Cincinnati, Indianapolis and Chicago Division have been equipped with extensive and systematically arranged passing and commercial tracks (210,054 lineal ft. of new track) and block stations, which facilitate the operation of the road under positive block.

Sixty miles of double track have been added during the past year, 20 miles by constructing a new second track on Cleveland Division, 20 miles by joint use of parallel tracks with the Erie Road on Indianapolis Division, and 20 miles by joint use of parallel tracks with the Chicago & Alton on St. Louis Division.

There were used during the past year 900,964 cross ties. During the year 360 miles of track were ballasted with gravel and chatts, and 13½ miles with stone.

Some of the New and Enlarged Bridge and Structural Mills.

The business of making bridge and structural steel seems to be inviting to capitalists. Although production has been increasing fast the manufacturers cannot keep up with the demand and the indications are that the year 1902 will be more profitable than 1901 to some of the manufacturers.

Some of the bridge building concerns tell us that after having sold their product for more than six months in advance, they are compelled to refuse further orders. Thus it does not seem that any considerable part of the large number of steel bridges for which contracts are yet to be let, as recorded in our Construction Supplement, accompanying this issue, can be contracted for and built this year.

Nevertheless many of the companies that are now refusing orders for bridges, and other companies as well, have recently enlarged their works, and are contemplating still further additions, both to shops and machinery.

Not only are the existing companies preparing to do more business, but several new concerns have recently been formed to make bridge and structural material. Some of these companies are mentioned below and others will be mentioned in a future isse. Two of these new concerns are in the Pittsburgh District and will compete with the four plants of the American Bridge Company there. These four are the Keystone Bridge Works of the Carnegie Co.; Pittsburgh Bridge Co.; the Shiffler Bridge Co., and the Schultz Bridge & Iron Co.

The American Bridge Company is now making studies of plans to enlarge some of its plants, but matters have not progressed far enough to make definite announcement. As stated in the *Railroad Gazette* some months ago the company has work for the Wabash railroad of such dimensions that it is impossible to make the necessary parts in its own shops or to get them elsewhere. The company is enlarging one of its Pittsburgh shops to do the work and this practically constitutes the only shop extension made by the company since its formation, although improvements in the way of machinery have been made at many of its plants. For more than two years the company has been considering building a large plant at Economy, near Pittsburgh, but it is said nothing has been done except to buy the land.

At present there are in the Pittsburgh district only two large independent bridge plants, one being the Fort Pitt Bridge Works, with works at Canonsburg, which, during the past year, have been more than doubled in size. The works of this company have a capacity of about 1,500 tons per month, and the company contemplates doubling this capacity during the spring. It uses the latest electrical devices for handling material.

The other large independent plant is the Columbia Bridge Company, whose works are located at West Carnegie, Pa. The concern has a fairly large plant but recently consolidated with the Pittsburgh Steel Shafting Co. Plans have been made for a new plant on 27 acres of ground adjoining the present site in East Carnegie, where extensive additions will be built. It is the intention of the company to go largely into the structural business, making beams, channels and other shapes, some of which will be used in the shafting works of the Pittsburgh Steel Shafting Co. It is said the new plant will cost over $800,000 and will give employment to about 600 men. The plans call for open-hearth furnaces, a blooming mill, a bar mill, structural mill and a shape plant. The contract for the engineering work has been let to the Stanyon Engineering Co., of Pittsburgh. The officers of the Columbia Bridge Co. are: President, Joseph Kuntz; Vice-President, Thomas W. Fitch; Treasurer, Thomas Walker.

Another bridge plant that will be built in the Pittsburgh district is that of the National Bridge Company, of which frequent mention has been made in the *Railroad Gazette*. The company has about 40 acres at Colonia, on the Pittsburgh & Lake Erie, about 20 miles from Pittsburgh, and near the new steel plant of the Colonial Steel Company. The site of the bridge plant is about 2,000 ft. on the railroad with a depth of 850 ft. The plant will employ about 1,200 men. It is proposed to have a capacity of 6,000 tons a month and the cost of building and equipment will be over $1,000,000. It is quite possible that after the bridge plant is finished, the company will build a steel car plant with a capacity of 20 cars a day. E. M. Scofield, formerly with the Groton Bridge Co., and later manager of the Youngstown branch of the American Bridge Co., is President and Manager, and W. M. Conger, President of the National Bridge Co., of New York, is Treasurer, and C. F. Blackman, Secretary. The main building will be 200 x 500 ft. The stockyard will be 200 x 2,000 ft. A producer plant will be provided for in case the natural gas becomes uncertain. The company will carry stock and handle orders for a large number of bridge plants in order to secure prompt completion of contracts. The company expects to begin work as soon as the frost is out of the ground.

Another independent plant is the Penn Bridge Co., at Beaver Falls, Pa. This concern has recently made very considerable enlargements to its works.

It is reported that some capitalists of Pittsburgh, said to include the Mellons, are considering building a large bridge works in the Monongahela Valley.

The Canton Bridge Co., at Canton, Ohio, contemplates additions to its plant which will probably double the capacity. The total investment will probably amount to $60,000 or $75,000. The improvements will include new blacksmith and template shops and an addition to its main structural plant.

The Massillon Bridge Co., which began the manufacture of iron bridges in 1869, has several times made extensions of its plant until 1893, when the last addition to the buildings was made, nearly doubling the capacity. New machinery has been added nearly every year since that time, so that the capacity has been still further increased. The company now has its shops crowded with orders and could use twice its present capacity to good advantage. Every few days it is obliged to refuse to bid on work. It would enlarge the plant, but cannot do so on the present location, as there is no room for more buildings.

The New Castle Bridge Co. was organized in 1896 and had a small shop in New Castle, Ind., and has been steadily enlarging its plant until the summer of 1901, when the company was reorganized and decided to move its shops to Indianapolis, where it could get better facilities. The company is now occupying its new shops, which are built of steel and brick entirely. The main building is 100 x 400 ft. There is a two-story office, with three main office rooms and a drafting room. The company tells us that it expects to do at least four times the business in its new plant that was done in the old shops in New Castle, and now has contracts to fully occupy it for the early part of the season.

Another company which has greatly enlarged its shop capacity is the Indiana Bridge Co., of Muncie, Ind. It began to make steel highway bridges in 1886. The first year's output was probably less than 300 tons, which increased until in 1897 it was 3,000 tons. Its output last year was about 4,500 tons. At the present rate at which the plant is running the company will turn out this year not less than 5,500 tons. Of course, this is not all bridge work, some of it being structural work for factory buildings, car barns and the like.

The Chicago Bridge & Iron Co., at Washington Heights Station, Chicago, Ill., has also increased its plant quite materially. Within the last year it has added an entire new power house and power plant, putting in electric transmission. It has also built a new template shop and expects during the coming year to build a new building to be used for blacksmith shop and machine shop, which will require a ground space of about 150 x 250 ft.

The structural steel department of the Illinois Steel Co., Chicago, Ill., is largely occupied with framework and supports in connection with mechanical appliances, such as mining and ore and coal handling plants. During the last three years the output has increased from an average of 600 tons a month to an average of about 3,000 tons a month. The company is constantly making improvements with no large extension at any time.

The Elizabeth Steel Bridge Works, Elizabeth, Ill., does quite a business in rebuilding highway bridges in many of the Western States. The Dakotas, Kansas and Nebraska are discarding their wooden bridges and are building iron bridges to a much greater extent than formerly, and this has led the Elizabeth Steel Bridge Works to establish a new factory for the manufacture of iron bridges in the West. This will be done in the spring. Geo. Skene is the proprietor and General Manager.

The Owego Bridge Co., Owego, N. Y., has been increasing its plant as follows: One shop, 75 x 120 ft., which has recently been completed; one shop, 80 ft. sq., also recently completed. The company has also material on hand for another shop, 75 x 150 ft., and estimates that this will triplicate its present outfit.

The Rochester Bridge & Construction Co., of Rochester, N. Y., has just bought the plant of the Havana Bridge Co., of Montour Falls. The annual capacity is 5,000 tons, an increase of 2,500 in two years. Additions have been made to the plant recently as regards pneumatic machinery, the plant being finally equipped with every description of pneumatic tools; also additions have been made throughout the shop generally of machinery, overhead trolleys and power hoists. The Rochester Bridge & Construction Co. is a comparatively new concern, having been organized during the past few months, with a capital stock of $40,000. The plant was transferred on Feb. 24, and the new owners propose to make some improvements. F. R. Stockley is President; Geo. F. Bar-

ton is Chief Engineer. The Contracting Manager is G. A. Sears, formerly Manager of the Highway Department of the American Bridge Co.

Another company which has recently made additions to its plant is the Clinton Bridge & Iron Works at Clinton, Iowa. It has added some buildings which make the total area covered by shop of about 78,000 sq. ft. The several new machines that have been added recently increased the output several hundred tons. Several more machines will be added this year. The company expects also to begin work in a few months on a new power plant consisting of new engines, boilers, air compressors and dynamos.

At Fargo, N. Dak., the Fargo Bridge & Iron Co., recently incorporated, will soon build its own shops to make bridges and all kinds of structural work. The prospects are said to be very good in the bridge building business in that section. The company has not fully decided on plans for buildings.

Another new company is the Wichita Bridge Co. It will build a plant at Wichita, Kan., and already has contracts for several bridges in that county.

During the past few years Canada has been building more iron and steel bridges than heretofore and several companies have been formed there to engage in bridge building, and the older companies have, from time to time, increased their facilities. The Dominion Bridge Co. tells us that it has recently added to its works a girder shop 600 x 55 ft., and a template shop 240 x 55 ft. The company proposes during the coming year to add new pattern-making and pattern-storage buildings; also to extend the machine shop and to build a new blacksmith shop. The dimensions of these buildings have not been settled. The changes recently made, with those completed, will make their capacity about 3,000 tons per month, day turn only.

The plant of the Canadian Bridge Company, at Walkerville, is quite new, having been built during last winter. The main building is 101 x 560 ft. and has been equipped with machinery of sufficient capacity to give an output of 1,000 tons per month.

Aerial Transfer Ferry Bridge Over the Ship Canal at Duluth.

This structure, designed to meet somewhat unusual conditions, presents a number of novel and interesting features. The canal at the narrowest part is 300 ft. wide and increases in width as it enters the harbor, the bridge crossing it at a point where the width is about 330 ft. Owing to the large amount of traffic through the canal, some 11 million tons of freight per year, to say nothing of numerous passenger and pleasure boats, an ordinary swing span would interfere materially with navigation, and further render such navigation unsafe in bad weather. Competitive designs were called for by the City of Duluth some years ago, but none of those submitted met the approval of the shipping interests and the government. The present bridge is designed to give sufficient clearance for the highest masts of the vessels entering the harbor and, as the ferry car is but 50 ft. long it offers less obstruction to navigation than the ferry or tugboat, while having an advantage over the latter in the fact that ice does not interfere with its use.

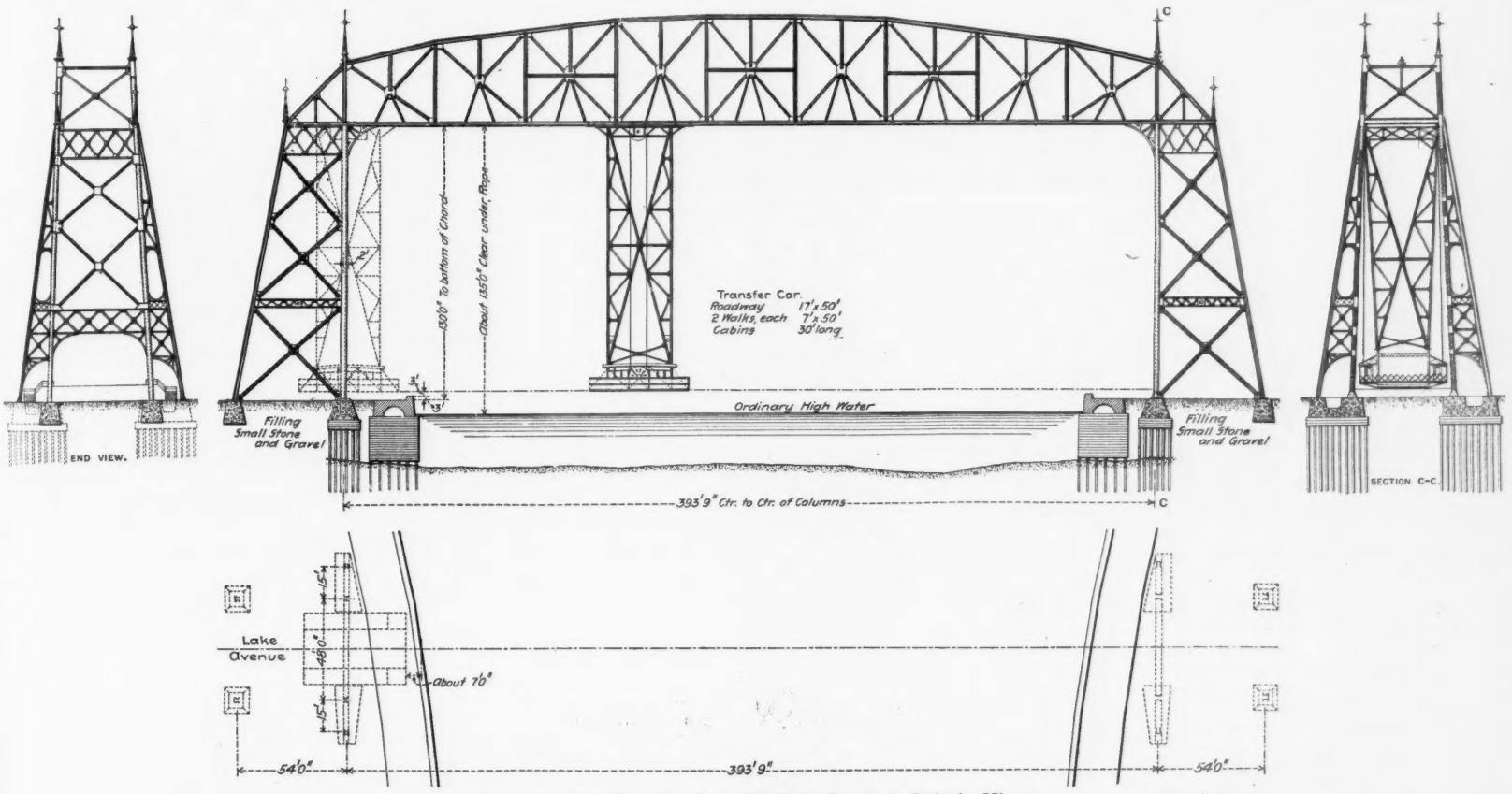
Bridges with suspended cars have been built on the Continent under the Arnodin patents, but the design of these is such as would render them impracticable for this location. They are of the suspension type and the car is suspended from the run-way above by ropes and is propelled longitudinally and held in position transversely by a heavy chain on the bottom of the channel attached to or near the abutments and carried up to the car and over a drum, the car being propelled in a manner similar to that of many of the small ferries; by rotating the drum and winding the chain on and off the drum. Such an arrangement as this would be impracticable in so narrow a channel as that of the Duluth ship canal.

In the proposed design the car is suspended from the truss above by rigid hangers. The run-ways and rails are built in the bottom chords. This construction forces the designer to provide not only for sufficient strength in the trusses to safely support the vertical weight of the car and traveler, but also to withstand the severe wind strains that result from the leverage of the wind acting on the car, this leverage being about 112 ft. The arrangement of the trucks in the bottom chord leaves comparatively little room to get at them and necessitates the providing of bearings which will run with practically no lubrication, and to meet this condition the trucks are fitted with roller bearings, the rollers being 1-in. hardened and ground steel rollers running upon a hardened and ground steel sleeve and casing.

The car is propelled by electric motors and cable drives. The traveler is provided with two trolleys. These trolleys are of special construction, consisting of 11-in. phosphor-bronze rollers and running upon a 2-in. bronze pin with a roller bearing made up of $^5/_{16}$-in. cold rolled brass rollers. The trolley travels in the "V" of a 4 x 4-in. angle, turned with the point upwards, so that the contact will never be interfered with by sleet. The cables are 1-in. steel ropes, six strands of 19 wires to the strand and hemp centers. The cables are made fast at the ends of the towers and are carried over the top of the traveler in the box of the bottom chord down over the large idler sheaves in the top of the traveler, making three half-laps around a spiral grooved drum on the car, and up over the idler sheaves at the top of the traveler to the other end of the bridge. The drums on the car are to be rotated by suitable gearing and motors of the street railway type. The roadway of the car is 17 x 50 ft., and there are two walks 7 x 50 ft., covered over in the center by cabins 30 ft. long.

Referring to the general plan it will be noted that the car runs into the tower at each end, necessitating a portal of the unusual dimension of 137 ft. high. This feature of the design at first appears to be a somewhat bold innovation on the common practice, but by a comparison of the ratio of the width of the braced posts with the height of the portal it is seen that it is well within the proportions common in through bridges, although on a somewhat larger scale. In order that the traveler may not be subjected to severe shock in coming into the landing, the car is suspended from the foot of the rigid traveler by links, the pins being 2-ft. centers, thus allowing the car to swing longitudinally sufficient to prevent damage to the traveler by the carelessness of the motorman in bringing the car into the slip.

The bridge is being built by the Duluth Canal Bridge Co.; Mr. A. Y. Bayne, Manager, and Mr. C. A. P. Turner, M. Am. Soc. C. E., 816 Phoenix Building, Minneapolis, designer and patentee of the construction. Credit should be given to Mr. Thomas F. McGilvray, formerly City Engineer of Duluth, for originally proposing a suspended car transfer at this point, his proposition being along the lines of the Arnodin bridge, but which, as has been pointed out, is hardly applicable to the location. Mr. McGilvray, as City Engineer, at once adopted Mr. Turner's suggestion to substitute a riveted structure for the suspended structure. His earlier design was described in the *Railroad Gazette* some time ago. Mr. W. B. Patton, the present City Engineer of Duluth, is looking after the interests of the City in regard to this contract. The ferry is designed to accommodate not only passengers and ordinary team and truck traffic, but also to carry electric street cars, when so desired.



Suspended Car Transfer Over the Ship Canal at Duluth, Minn.

The Improvements on the Pennsylvania Division of the New York Central & Hudson River Railroad

WITH AN INSET.

Prior to 1899 the interests of the New York Central & Hudson River Railroad in the coal regions of Pennsylvania embraced the territory served by its leased line, the Beech Creek Railroad, extending from Newberry Junction, near Williamsport, to Mahaffey, Pa., a total of 125 miles. The coal originating on the Beech Creek Railroad destined for tide-water was delivered to the Philadelphia & Reading Railroad at Newberry Junction, and that consigned to northern points was delivered to the Fall Brook Railroad at Jersey Shore, Pa., reaching the main line of the New York Central at Lyons, N. Y.

In 1899 a new Division (known as the Pennsylvania Division) was organized by a consolidation of the newly-acquired Fall Brook system (composed of the Geneva & Lyons Branch of the N. Y. C., the Syracuse, Geneva & Corning R. R., original Fall Brook Railroad, and the Pine Creek Railroad), the Beech Creek Railroad, and the Pittsburgh & Eastern Railroad, aggregating 430 miles of main line. The consolidation of these railroads under new management largely increased the opportunities for developing the bituminous coal traffic, and the company has adopted extensive plans for the improvement of the property.

The larger part of the coal tonnage originates along the line of the Beech Creek Railroad, particularly at the western end, and there is also a very large and growing business resulting from traffic arrangements with the Buffalo, Rochester & Pittsburgh, which connects with the Beech Creek at Clearfield, Pa. Owing to the heavy grades (maximum of 80 ft. to the mile) on the old Beech Creek Railroad between Clearfield and Jersey Shore, the opportunities for handling an increased tonnage were restricted, and it was deemed wise to build a new line along the West Branch of the Susquehanna River, which would afford light descending grades of 10 ft. to the mile from Clearfield to a junction with the old line near Oak Grove, Pa., a distance of over 100 miles. This new route consists of 45 miles of trackage rights over the Philadelphia & Erie Division of the Pennsylvania Railroad; 22 miles over the Karthaus Branch (Susquehanna & Clearfield R. R.); of the Pennsylvania Railroad, acquired by purchase, and 30 miles of new line from Karthaus to Clearfield. In order to put this route in first class condition for handling heavy business, the Philadelphia & Erie Division of the Pennsylvania Railroad is now in process of double-

tracking the portion of its line to be thus used by the Beech Creek Railroad; the Karthaus Branch is under reconstruction, with new bridges, 80-lb. rail, and stone ballast, and the new line (Karthaus to Clearfield) is rapidly approaching completion. The reconstruction of the Karthaus Branch includes an expensive new connection with the Philadelphia & Erie Division of the Pennsylvania Railroad at Keating, Pa., including a 4-span bridge, 100-ft. plate girders, over Sinnamahoning Creek.

The new line follows closely the West Branch of the Susquehanna River and involves heavy construction. There are four tunnels, as follows:

Karthaus Tunnel	1,440 ft. in length.
Deer Creek Tunnel	1,080 " " "
Shawsville Tunnel	1,725 " " "
Fulton Tunnel	2,695 " " "
Aggregating	6,940 ft. in length.

These tunnels are through sandstone, requiring partial timbering with concrete lining at the ends and concrete portals. There are three crossings of the Susquehanna River:

Shawsville crossing, consisting of 6 100-ft. deck plate-girder spans.
Fulton crossing, consisting of 3 spans of 100 ft., and 2 spans of 60 ft., deck plate-girders.
Poor House crossing, 4 deck plate-girder spans of 100 ft.

The piers throughout are built of first class sandstone masonry and the abutments of concrete, with sandstone bridge seats and copings, and all structures for smaller water courses are of concrete or cast-iron pipe. The line is to be laid with 80-lb. rail and stone ballast. At distances of about six miles side-track facilities are provided for the accommodation of 100-car westbound trains and 75-car eastbound trains. Water columns with gravity supply are placed at every other station.

For facilitating the movement of rapidly-increasing traffic, double-tracking is contemplated at various points on the division, and the portion from Jersey Shore to Newberry Junction, a distance of 12 miles, is practically completed. The latter work has required the construction of new bridges (both steel and masonry) and includes an interesting double 40-ft. arch structure of concrete and sandstone.

Many of the existing side-tracks on both the Beech Creek and Fall Brook systems have been lengthened to admit the use of increasing train lengths with the heavier power. Numerous side-tracks and spurs have also been built in the coal fields for developing the new coal operations, including the new Arcadia mines at the terminus of the Pittsburgh & Eastern R. R., and the new Canoe Creek mines near Punksutawney, Pa.

Increased number of train movements with heavier power has required radical improvements in the water supply. Originally small gravity supplies were sufficient for the medium amount of business, but the increased movement has necessitated the installation of pumping plants at the more important points, with larger tanks and stand-pipes.

Modern yards, with engine houses and other terminal improvements are projected and under construction as follows:

Extension of the Newberry Junction Yard,
New Yard at Oak Grove,
Extension of the old yard at Clearfield.

At Oak Grove and Clearfield new modern engine houses are to be built, with modern ashpits, coal trestles, water supply, and other facilities for expeditious and economical handling of power. The general arrangement of these yards and the details of the motive power facilities are illustrated by the accompanying plan of the Oak Grove yard, which contains an ashpit of the company's approved design, and a coal trestle with 40-ton pockets. The profile shows the classification, grade, etc. The working of the yard is simplified by the fact that it is designed solely to handle coal, and the loaded traffic all moves in one direction. Philadelphia & Reading cars are classified and handled separately. The weighing scales shown in the plan are on a hump 7 ft. high, with automatic device for recording the weight of each car as it passes over.

Originally the Beech Creek had small shops at Jersey Shore, and the Fall Brook system similar facilities at Corning. Both were poorly placed and inadequate for handling the business of the new division, and new shops are designed for location at Oak Grove, about two miles west of Jersey Shore, and just easterly of the point where the new low-grade connection with the Philadelphia & Erie Division of the Pennsylvania Railroad joins the Beech Creek. A large area of land was acquired for this purpose, and modern shops are under construction and will probably require about three years for completion. It is expected, however, that engine repairs can be started in the new plant in the summer of 1901.

The construction of the new route from Clearfield to Oak Grove gives a low-grade line from the coal fields and also from the Buffalo, Rochester & Pittsburgh Railway connection, to the connection with the Philadelphia & Erie at Newberry Junction. The grades on the Fall Brook, from Jersey Shore northerly to Lyons, range from 26 to 35 ft. to the mile against northbound traffic, and it is intended in the future to modify the short maximum grades that now limit trainloads. Southbound, however, from Lyons to Jersey Shore, there are many heavy grades that can be reduced so as to very largely increase the trainloads, and it is expected that within the near future active work will be started at points north of Corning, N. Y. This is very important, owing to the fact that there is an extensive back-haul of ore from the Lake ports over the Fall Brook to connections west by means of the Beech Creek and the Buffalo, Rochester & Pittsburgh, and this traffic is at present considerably handicapped by the existing grades.

The increased weight of motive power has necessitated the reconstruction of all of the old bridges on the Fall Brook line between Lyons and Newberry Junction. At many places, in conjunction with the revision of grades, it is intended to replace steel structures with concrete arches and solid filling. At the other points the light iron bridges are being replaced with heavy steel structures of modern design. This has required the treatment of 123 bridges, aggregating 7,442 ft. in length.

Herman's Automatic Electric Semaphore.

Mr. R. Herman, of Crafton, Pa., has designed and patented an improved motor and "slot" arrangement for automatic signals worked by electric motors, and we show herewith some illustrations of the machine, made from photographs and drawings which he has sent to us. The instrument is designed to work three-position signals, and it was in making instruments of that kind for the signals on the Fort Wayne road, described in the *Railroad Gazette* of Jan. 18, 1901, that Mr. Herman acquired the knowledge of the needs of automatic signaling which enabled him to produce the present design. He has also provided such additional features as were shown to be necessary by the practical road operation of the 200 signals on the Fort Wayne.

All parts of the mechanism are built on true mechanical lines and are calculated and arranged to withstand the rough usage to which such mechanism is frequently subjected by inexperienced employees. The machine consists essentially of a motor, a train of gears, a sector, to which is fastened the semaphore rod, a locking and a clutching device, a semaphore rod and a semaphore arm. All parts are easily accessible and are arranged with

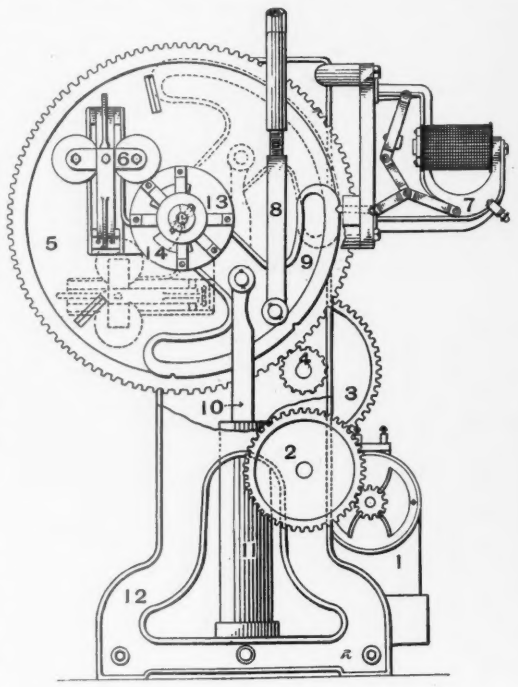


Fig. 1.—Herman Signal Motor.

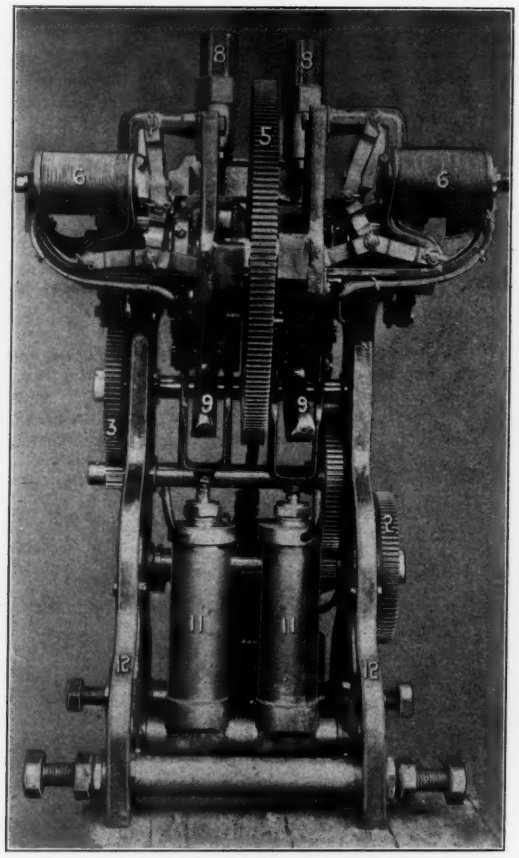


Fig. 2.—Herman Electric Signal Motor.

conspicuous oil cups. The machine is self-contained, the motor being fastened to one of the lower frame spindles; so that the entire work of erection can be completed before installing the mechanism.

The load on the motor is absolutely uniform at all times. This is accomplished by making all parts of the mechanism absolutely balanced and by utilizing the Herman semaphore blade and casting. In this latter, the counterweight is so arranged that no matter in what position the blade may be, the load on the motor is absolutely the same. In an exhaustive series of tests made under varied conditions the current consumed was in each case found to be uniform throughout the movement of the arm. This is no small consideration, for the most economical battery arrangement may be easily determined upon, and the cost thereby reduced to a minimum. In signals of this kind in which the load is not uniform during all parts of their movement (and it has been found that the maximum current consumption of some signals is as much as three and one-half times the minimum) a failure is easily possible in consequence of the batteries not being able to supply the maximum current. In order to avoid this, much larger battery capacity is needed than would otherwise be required.

Another conspicuous feature is the entire absence of delicate circuit-controlling devices with their platinum pointed contacts. The circuit controller in the Herman signal is based on the sector switch principle. Non-corroding metal with large contact surfaces is used, thereby insuring always an absolute low-resistance electrical contact.

The mechanism is suitable for all conditions of electric signaling. Any type of signal, two-position single arm, two-position double arm, three-position single arm, or three-position double arm, is operated by one motor and one mechanism. For rapid switch movements the signal is particularly adaptable, as the direction of motion of the semaphore blade is instantaneously changed automatically with any change of track conditions. It is not required that the movement which has already begun should be completed before the signal can move to its new and correct position. The machines never need to be adjusted.

Fig. 1 shows a side view of the machine with part of one standard broken away, and Fig. 2 a front view of the mechanism of the two-arm machine. This type can be arranged to indicate either two or three positions for each arm, the operation of one being entirely independent of the other. Referring to the numerals, 1 indicates the motor which operates the train of gears 2-3-4; pinion 4 meshing with the main driving clutch wheel 5, carried by the main shaft 14. This main driving wheel is provided on each side with a number of V-shaped recesses which are adapted to receive the clutch 6. The clutch magnets and frame are attached to the sector 9. This clutch, on being energized, locks the main driving wheel 5, to the sector 9, which is fastened to the main shaft 14. These two parts (sector and driving wheel) are thus locked together and the motion of the driving wheel is transmitted to the sector, to which is attached the connecting rod 8, which is in turn fastened to the semaphore arm by means of a rod and crank not shown. The sector 9 is provided with V-shaped recesses in its rim. These may be spaced so as to permit locking the signal in any desired position. The locking device 7 consists of a high-resistance electro-magnet whose armature is fastened to a compound toggle lever which, in turn, acts on the locking block that engages the recesses in the sector rim. The clutching device 6 is of similar construction, its magnets, however, being of low resistance and in series with the motor.

A duplicate sector similar to 9 is situated on the opposite side of the driving wheel 5, as shown in dotted lines in Fig. No. 1. (See also Fig. No. 2.) The operation of this sector, which is arranged with a clutching device like 6, and is held by a locking device similar to 7, is independent of that of sector 9, and controls the movement of the second arm of the signal.

Upon de-energizing the lock-magnet 7, the locking block releases the sector 9, and the weight of the semaphore rod and casting moves the signal to its "stop" or any intermediate position. A dash-pot 11, whose piston rod 10 is fastened to the sector, takes up the shock incident to this movement (usually from clear to caution or from clear to stop).

Fastened on the main driving wheel shaft on one side and on the sleeve of the sector on the opposite side, are the circuit-controlling devices 13. Each consists of sector blades operating in metal clips, the time in which two clips are in circuit depending on the operation of the main driving wheel shaft in the one case and the sector (shown in dotted lines) in the other. In order to dispense with all hanging wires, rotating connections are mounted on the side of the sectors and standards. These are of similar construction to the controllers above-mentioned.

Fig. 3 shows a complete two-arm, three-position signal. The upper arm is in the "green" or caution position and is shown in dotted lines in its "white" or clear (vertical) position and in its "red" or danger (horizontal) position. The lower arm shown in the clear position is identical in

operation to the upper one. The heads carrying the semaphore shafts, lamps, and ladder are of unique design in that they may be rotated about the signal post. Each may be fastened in any position irrespective of that of the other or of the mechanism below. This is an advantage where signals are used on curves or at crossings. Both semaphore arms are also mounted in the same head, and may thus be used as two or three-position automatic office block signals to indicate train movements in opposite directions. Fig. 4 is a front view and Fig. 5 a side view of a single arm two or three-position signal. This is identical to the above described double machine except that there is but one sector, semaphore rod, dash-pot, clutching device, and locking device. This as well as the two-arm signal is made in various lengths, 12, 18, 25 and 32 ft. being the usual height. Fig. No. 6 shows a Herman standard signal in use on the Pittsburgh division of the Pittsburgh, Cincinnati, Chicago & St. Louis Ry. Any of the ordinary circuits now in use, open or closed, will operate the mechanism. The double arm machine is connected to two distinct track circuits.

The current required to operate the signal is 1.6 amperes and on a basis of 250 movements a day of 24 hours, the total consumption of each signal is 3.3 ampere hours a day, based on an E. M. F. of 12 volts.

Two of the signals have been in practical operation for the past seven months on the Pennsylvania Lines West of Pittsburgh; and one of them controlling switch and main line movements to the extent of 500 a day, Mr. Herman informs us, has operated without a failure since installation.

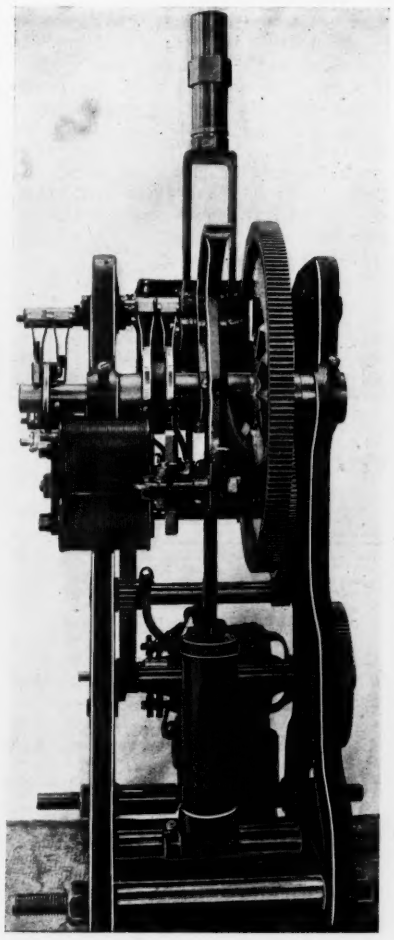


Fig. 4.

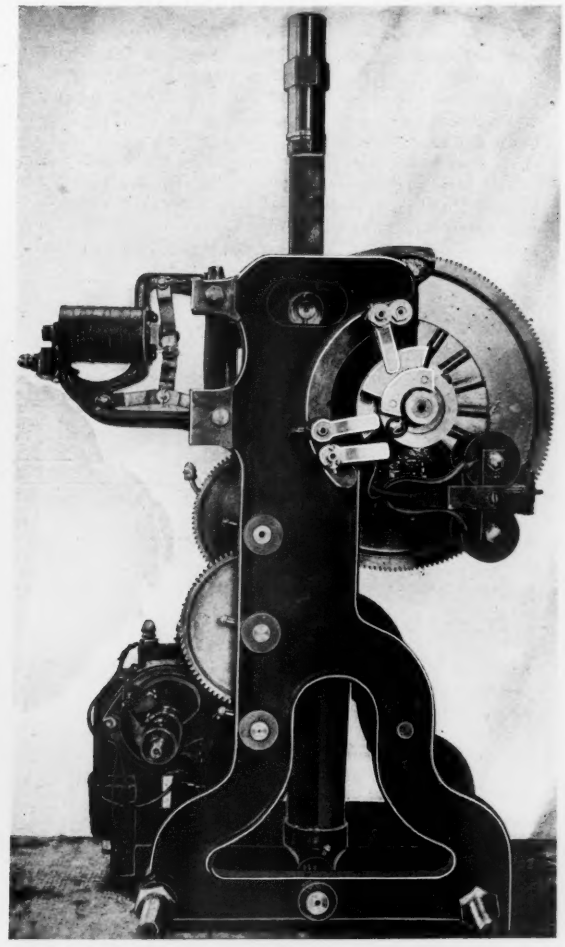


Fig. 5.

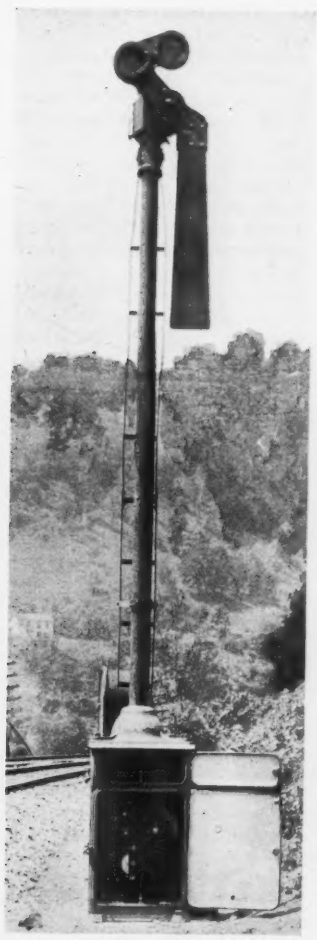


Fig. 6.

The Herman Automatic Signal Mechanism; for One-Arm or Two-Arm Semaphores, Two-Position or Three-Position.

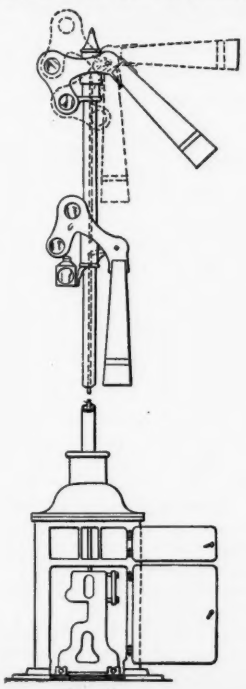


Fig. 3.

American Development From an English Standpoint.

Last week we printed extracts from three of the addresses at the Baldwin birthday dinner. The report of the speech of Mr. J. Harris Sanders, London Agent of the Baldwin Locomotive Works, was not received in time for that issue. Extracts follow:

Mr. John H. Converse.—Some four or five years ago there came into our office an Englishman who announced his errand in about the following language: "For years I have been in business in London, and my business has been the sale of machinery and other English products to the British Colonies and to the United States of America; but the tide has turned and I perceive that the time has come when the machinery and the products of the United States are to be sold in England and to the British Colonies. I don't propose to kick again the pricks or to oppose the trend of events; I am going to adapt myself to the situation and to take up the distribution of American products." That Englishman is with us to-night. He will speak to you on "American Development from an English Standpoint." I have the pleasure of introducing Mr. J. Harris Sanders.

Mr. Sanders.—I have been asked to speak, as the Chairman has told you, on "American Development from an English Standpoint"; and I think it will be wisest for me to give you my own personal experiences and draw my own comparisons; knowing intimately, as I do, the Continent of Europe as well as the Continent of America, and having been connected with the commerce on both sides of the Atlantic, and having seen the changes taking place year by year as you have developed into exporters of the articles you used to import. I have seen infant industries over here, under fostering care, grow into big billion babies; and perhaps I may live to see them strong enough to run alone and your country, on a free trade basis, command without a serious rival the commerce of the world.

I think I should begin by correcting a misapprehension. I am only half an Englishman—my better half being an American. But I would like to point out to you that our personal history, my wife's and mine, in miniature is the history of the Anglo-Saxon people on both sides of the Atlantic. My wife's ancestors came over, if I remember rightly, in a twin screw steamer called "The Mayflower." The cargo consisted chiefly of their furniture and old silver, which has since been distributed pretty nearly all over your country. Some hundred years afterwards my ancestors were chasing hers on the high seas. They caught one of them, shut him up in prison in Bristol, from where he happily escaped to the coast of France, got back to his own country and commenced again quite unrepentant. Nearly a century afterwards I came to this country. I also was taken captive. I was tied to a chariot wheel and have remained in that position ever since. And it has seemed to me that, since I have known America, a better understanding, bred of more intimate knowledge and mutual respect, has been continually growing between the Anglo-Saxon people on the two sides of the Atlantic. . . .

To-day you are recognized as the greatest nation in the world, and yet I am sure that I can assert that the world generally does not know what America means. Commercially, they look upon you with a certain amount of fear mixed with wonder and curiosity. The governments of the world recognize that a new and mighty force has suddenly taken its place in the councils of the nations. . . .

Your rate of progress is the wonder of the world; and that is a progress which neither American nor outsider could have attempted to predict or to prophesy 70 short years ago. So, there must be adequate reasons for this. And what are they? I stayed, the beginning of this week, with an American relative, and I asked him, having to-night in view, if he could tell me why America was so great. "Yes," he said, "I can; because an American can dive deeper, stay under longer and come up dryer than any other man on earth." I thought possibly there was something in it. I had the charge, some 18 months or two years ago, of the exhibits of the Baldwin Locomotive Works at the Paris Exposition. We sent, among others, a large locomotive there. The French Government, with which we had been doing some business, asked to be allowed to buy it and exhibit it (as they did) with the name "French State" on it, in their section of the locomotive department of the Exhibition. We sold them the locomotive, they put their name on it and exhibited it. We immediately got over another locomotive from here, of pretty much the same type, and put that in the American Section, which was close by. It became manifest to me then that there was some one connected with the Baldwin Locomotive Works who could "dive deeper, stay under longer and come up dryer" than—at any rate—than a Frenchman. The instructions were sent over to jack up this locomotive and run it with compressed air. We found that when any one was inclined to look at the French locomotive our driver started our locomotive. At first it startled and frightened the onlookers and then aroused curiosity; and then no one was allowed to look at any exhibits in the locomotive department except ours, unless temporarily the compressed air gave out or our driver was tired. You may possibly know that the French Government, or rather the jury, awarded the Grand Prix to the Baldwin Locomotive Works and a gold medal to Mr. Vauclain, and one of the jurors said to me, "You deserve that Grand Prix for running that locomotive standing still, if for nothing else."

You have here (among many that might be enumerated) a few reasons that I will mention for your grand and rapid development—a virgin soil, new mineral resources, a diversified climate and every variety of prod-

uct. . . . You are also blessed with laws of your own making, though here I don't specially refer to the New York Custom House. You are unrestricted by vested privileges, ancient rights or mediæval laws. And there is another consideration that is of inestimable value to your country. You are more sober, as a people, than either England or France. Statistics show that you drink less per capita than Englishmen or Frenchmen. When one considers that England spent, last year, very nearly a thousand million dollars on drink, it is manifest that a country cannot afford to waste anything like so large a proportion of its earnings as that. The wisdom displayed by the majority of your people in drinking only half as much as they drink in England and France is very manifest and evidently also a great advantage to your people generally.

You also set a higher standard of education here—primary education and technical education—and I find here that the managers of all your great industries, railroad and others, are specially educated for the position they are going to hold; and this is much more generally the case than obtains with us in Europe or in England. With us education is still looked upon—I am speaking now with regard to England—very differently from the way it is regarded here. I have been brought into contact, for the last seven years, pretty prominently with what I would call "educational officialdom," and I have been surprised to find it asserted that it was not wise to educate the children of the poor too much because it unfitted them for their stations in life. And within the last few months the bulk of the evening schools throughout England, that have been doing valuable work for years, have been closed.

But I think the principal reason for the wonderful development of your country is that while you have been developing a continent you have offered a greater reward for labor here than any other country, you have drawn the most forceful manhood of Northern Europe here. The man who comes to seek his fortune in a new country, with a bundle on his shoulder, is the most forceful man. Then, again, you have set a standard here of the highest excellence and the most strenuous exertion; everyone doing the best he can and all that he can. With us, unfortunately, we have a different standard, a leveling down, a rule that every one should be brought down to the dead level practically of the man who was born tired and who has grown lazy. I was over here a short time last spring and, on my return, I was talking to a friend in London and told him how astonished I was when I came over here and that, upon each visit, I felt more astounded with the growth and prosperity of your country. He asked me to indicate to him what was the most remarkable thing I had seen; and, after thinking a minute, I said, "I saw two men running." On two occasions I saw groups of four or five men moving something heavy. A tool was wanted, a roller or a crowbar, and two men ran to get what was wanted and ran back with it. My attention was attracted by that; yours no doubt would not have been. . . . You can easily imagine that when, in the working class of society the idea obtains, that work is a thing to be spread out, to be made to last as long as possible, it becomes useless to hope to compete with a community that is strenuous and earnest in all that they do. . . .

And now that you have become the greatest and most powerful nation in the world imagination fails to picture what America will be in another generation, and may we not consider for a moment how great power and wealth bring great responsibility? Your mother country, though in her history she has made many mistakes and in the opinion of many of her children is making some now, still has for centuries been looked to as the cradle of liberty. Your country has become the home of liberty. The mantle of the mother country is descending upon you. May you always remember that the price of liberty is ceaseless vigilance. May you use your foremost position of great usefulness wisely in the interest of liberty and peace throughout the world—of liberty in its highest sense—remembering your own glorious early history and, while preserving your own, ever promoting the liberty of others.

But before I sit down bear with me while I pay a tribute to your greatest product, the American woman; who, to the grace and beauty of European women, adds the charm of vivacity, of attractiveness and, may I add, a will of her own. I have always admired the wisdom of the fathers of your country in the framing of the Constitution and never so much as in their choice of the American eagle as your country's emblem, remembering that that eagle is a hen bird.

The Prussian Minister of Public Works makes to the Diet an estimate of the earnings and expenses of each year in advance; and at the same time submits estimates for proposed expenditures on capital account—new lines, rolling stock, second track, stations, etc. For the coming year he estimates a considerable decrease in gross and net earnings; in spite of which he proposes expenditures for new work to an amount greatly exceeding any ever made before 1901. In millions of marks this "extraordinarium" is to be 91.6 in 1902, against 100.8 in 1901, and 81 in 1899. Of the sum asked for this year 37 millions is for additional rolling stock, besides 55 millions for rolling stock maintenance. Important new stations are to be built also. The Minister says expressly that much new work has been undertaken for the purpose of affording work in dull times.

The Monongahela Bridge for the Wabash Railroad at Pittsburgh.

One of the most aggressive developments of modern railroading is the extension of the Wheeling & Lake Erie Railroad into the City of Pittsburgh, and forming part of the Wabash system, so called. (See the *Railroad Gazette*, Sept. 27, 1901, p. 665.) Although this extension is only about 60 miles from Jewett on the Wheeling & Lake Erie Road it involves two great bridge crossings, besides numerous viaducts and tunnels, and is heavy work almost every foot of the way, necessitated by maximum grades of 35 ft. per mile, and 3 deg. curves, having a short stretch of 1 per cent. grade near the Pittsburgh end.

The Monongahela crossing bringing the line into the City of Pittsburgh is about half way between the Smithfield Street Bridge and the Point Bridge, being over what is known as the "Pool" or harbor of Pittsburgh, encroachments on which are jealously watched and guarded by the powerful coal and river interests. Charter requirements necessitated a single span from shore to shore, which fixed the span at 812 ft. on pier centers. This, in turn, forced the selection of the cantilever type of bridge. This bridge being intended for the heaviest double track modern service, is certainly one of the most remarkable railroad bridges in the world. It is, we believe, the heaviest per running foot, and the dimensions of its members have never before been reached. Indeed the eye-bars cannot be made with any equipment now in existence.

The cantilever type of bridge at best can hardly be claimed as a graceful structure, particularly when navigation and grade requirements necessitate a straight horizontal chord, but the engineers must do the best they can within the limitations of the problem and a consideration of prudent economy.

The general dimensions of the Monongahela Bridge are as follows, on center measurements: Anchor arms, 346 ft.; lever arms, 220 ft.; suspended span, 360 ft.; center to center shore piers, 812 ft.; clear waterway between piers, 786 ft.; total length between anchorages, 1,504 ft.; trusses, 32 ft. on centers; tower, depth, 126½ ft.; center depth of trusses, 60 ft.

The difficulty of establishing a sightly diagram where the variation of truss depths is so great as in a long span cantilever, was overcome by varying the panel *lengths*. For four panels either side of towers, the panels are 40 ft. long, the remaining panels being 30 ft. in length.

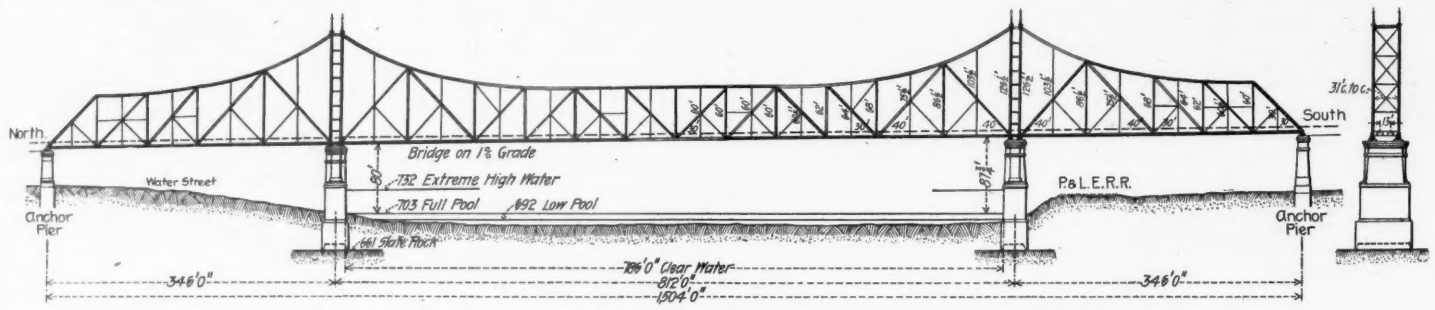
The best idea of the magnitude of parts required in such a structure can be had by the realization of what 14-in. eye bars and 12-in. pins mean with their corresponding compression members and in detailing.

The shore piers are practically twin masses of masonry, spreading out symmetrically on center of figure so as to unite for a uniform distribution of weight over the foundation masses. The twin piers are united with heavy curtain walls, and a heavy concrete top in which are bonded stout steel ties. The apparent mass of a pier under the coping is 22 ft. x 46 ft., and in the body below the flood line 25½ ft. x 59 ft. The pneumatic caisson foundation is 33 ft. x 66 ft. carried down to a level slate rock 36 ft. below the lowest water, the resulting load on which is 9½ tons per sq. ft. The piers are to be Beaver Valley sandstone ashlar with concrete hearting, the bridge seat stones being granite 2 ft. thick, on which is allowed a pressure of 500 lbs. per sq. in. from the cast-steel bearings of the cantilevers, which becomes 200 lbs. per sq. in. on the underlying coping.

The anchor piers will be monolithic concrete work entirely, and also of twin design, each pair being united by a monolithic arch with embedded steel bars. Each twin will have an anchor bar shaft 4 ft. x 6 ft. for a depth of 30 ft. to allow an easy pendulum swing of the upper anchor bars from temperature movement of the anchor arm.

The work was put under contract from elaborate ¾-in. detail plans, the American Bridge Company taking the superstructure, under agreement of having it fully erected four months after the completion of the masonry. The masonry and foundation work is under contract with Arthur McMullin & Company, of New York, who, in turn, are under bond for the completion of the masonry by next August. If both contractors are up to the mark, this great structure will be completed this year, and be an accomplishment of unmatched expedition.

The Monongahela Bridge was designed by Boller & Hodge, of No. 1 Nassau street, New York City, in whose charge it is being executed, as well as all the bridge and viaduct work of the whole Wabash extension.



Monongahela Bridge—Pittsburgh, Carnegie & Western Railroad (Wabash), at Pittsburgh.

Designed by Messrs. Boller & Hodge, *New York.*

The Goodwin Car in Service.

We shall not stop now to describe the Goodwin car which must be thoroughly well known to our readers. Although it is so well known it has not up to the present time been generally adopted by the railroads. Probably this is largely because until very recent times the economies which this car is capable of producing have not been realized, or the conditions have not been favorable to its use. Recently, however, the company has largely increased its facilities for manufacture and the car is going into pretty wide use. Below are some facts as to the places where it is now in service and the sort of work that it is doing.

The Pennsylvania Company (West of Pittsburgh) has been using for something over a year a similar number of Goodwin cars for substantially the same service.

The Central Railroad of New Jersey has been using for a number of months past a similar number of cars for handling the material which is delivered to it from the New York Subway excavation. This material is used for trestle filling and elevation of roadbeds in the neighhood of Jersey City.

The Chicago & North Western Ry. has leased Goodwin cars for filling a number of trestles on its main line. The material was hard clay, loaded with steam shovels, and the work accomplished was very satisfactory to all concerned.

A number of large contractors have leased Goodwin cars for track elevation and filling for different railroads.

MacDonald & Onderdonk, contractors for the Jerome Park reservoir in New York City, have had Goodwin cars in service under lease for several years handling the excavated material, carrying this material eight or nine miles and utilizing the cars for handling rock for filling.

The Sandy Hook government trestle in New York Harbor was filled with large rock by the use of Goodwin cars under lease.

The Great Northern used 24 Goodwin cars for a year and a half in handling rock from the Cascade tunnel, discharging this material from the main line of the road while the train was moving without interfering with the traffic.

The general service of this car for maintenance of way will be appreciated when it is understood that the car will discharge broken stone for ballast either between the rails or at the side of the track, depositing any desired quantity of material, or it can be utilized for track elevation work or trestle filling, discharging from either or both sides of the car, discharging clean of the rail any class of material used for filling, either in large or small masses, and any railroad securing the Goodwin cars for the service of maintenance of way in the summer months can utilize the car for general traffic and handling all sorts of dumpable freights through the winter months, thereby relieving the railroad of the expense of maintaining a ballasting equipment that does not earn for the railroad during the season of the year when ballasting is impossible. Further a car of this description can be utilized for ballasting and filling purposes on its return trip to the mines or quarries, reducing the expense of handling empty trains over the railroad.

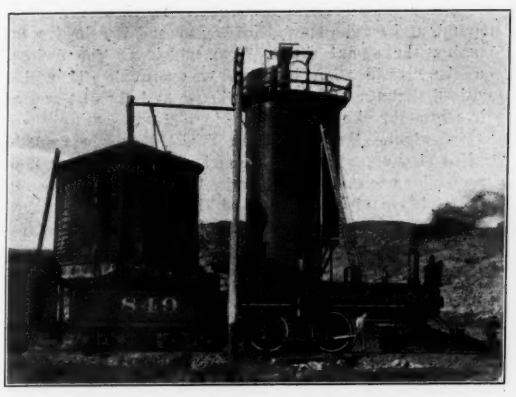
In discharging bituminous coal through the center discharging openings now in vogue at docks all through the country where hopper cars are in service, the Goodwin car can be used without any change of these docks. The center discharging feature of the Goodwin car, rendering it possible to discharge through the usual hopper between the rails on the dock is a saving of time and labor over the hopper car, as the carrying floor of the load is dropped

away from contact with the load in the discharging operation, which tends to shake up and distribute the material being discharged rather than to pack the discharge. Comparisons are also made by the Goodwin Car Company in handling coal in the tipping machines used on the Great Lakes and the handling of the same material from Goodwin cars.

These features of coal handling, although they do not appeal directly to the engineers of maintenance of way, are claimed to be one of the economical features for the car, enabling the railroad to utilize the ballasting and grading car for traffic during the season of the year when the maintenance of way equipment is usually idle.

Kennicott Water Softener—Union Pacific Railroad.

An automatic, continuous water softener, with a capacity of 150,000 gals. a day, was installed last November at Point of Rocks, Wyo., on the Union Pacific by the Kennicott Water Softener Co., of which the J. S. Toppan Co., Chicago, is the agent for railroads. It is operated under particularly difficult circumstances being in a desert country far from supplies and shops. Sectional drawings of such an apparatus were shown in our issue of Dec. 14, 1900, page 828. The photographs of



Kennicott Water Softener—Union Pacific R. R.

the Union Pacific plant reproduced here give a very good idea of the size and appearance of this softener.

The settling tank is a steel cylinder 43 ft. high and 13 ft. in diam., alongside of which is the lime water tank, which is 25 ft. long and 3 ft. in diam. The water comes from two artesian wells about 1,000 ft. deep and it is led to the softener through a 6-in. supply pipe. The treated water is drawn off into two 50,000-gal. storage tanks located about 400 ft. apart. The apparatus has been treating about 155,000 gals. of water a day and the following sample analysis shows the quality of the water before and after treatment.

	Grains per gallon. Before treatment.	After treatment.
Silica	0.79	0.40
Carbonate of lime	9.86	3.45
Carbonate of magnesia	3.51	0.20
Sulphate of magnesia	7.03	None
Carbonate of soda	1.12	0.29
Sulphate of soda	4.70	7.80
Chloride of soda	16.48	14.49
Total solids	43.49	26.63
Incrusting solids	21.19	4.05

In addition to supplying water to locomotives at this station five cars of softened water are shipped daily to other points. For this service pressed steel gondola cars are used, having caulked seams, wooden tops and splash boards. These cars will each hold 9,000 gals. of water.

The working of this plant has met expectations and the average results for a week are indicated by the following: The untreated water is strongly impregnated with sulphide of hydrogen gas, which is removed by the treatment. There were 21.19 grains of incrusting solids per gal., of which 16.01 grains were removed by the treatment, so that the treated water contained 5.18 grains of incrusting solids. These figures are from analyses which are fairly representative of average conditions for a week, although lower results have frequently been obtained. This shows that 2.77 lbs. of incrusting solids were removed per 1,000 gals. of water, which at this rate at this station amounts to 352 lbs. a day, or in the course of a month about five tons of scale forming material are removed which otherwise would be deposited in locomotive boilers. The regular water station pumper does what work is needed at the softening plant and there is no extra charge for attendance on account of the water treatment. The machine is equipped with a new device which hoists the chemicals to the top in barrel lots, the power being supplied by a water wheel driven by the supply water. The cost of chemicals is practically 1 cent per 1,000 gals., or $1.55 a day.

The apparatus is essentially a steel settling tank having a conical bottom. From the point where the water enters at the top there is an inner cone-shaped partition increasing in diameter toward the bottom, the water flowing downward inside the cone and ascending between the cone and outer shell to the soft water overflow.

A dump valve, operated by a lever, is placed at the lowest point and discharges into the sewer. The overflow for the purified water is near the top of the tank. The water to be purified enters through the supply pipe at the top and flows into a box having a slot in the bottom. Through this slot water is admitted above a water wheel, which is used to drive auxiliary apparatus. After passing over the wheel, the water enters a compartment at the top of the conical conduit, where it mingles with the lime and soda solutions. As the water flows down this conduit, the rate of flow decreases as the cross-section of the cone increases, and the precipitate falls away from the water as it descends and collects in the conical bottom of the tank in the form of mud. This mud is blown out periodically through the dump valve.

The cross-section of the base of the cone is approximately equal in area to the cross-section between the cone and the sides of the tank. The cone serves an additional purpose in that it holds the small particles which will not settle until they are caught and carried down by heavier particles from above; the cone serves as an oil trap in case it is also required to use water condensed from the exhaust of engines. The water after leaving the cone turns and flows upward to the overflow, constantly decreasing its rate of flow because of the increase of cross-section. In this space also is a series of baffle plates, and finally after passing through a wood fiber filter the purified water passes out through the overflow pipe. It is found that most of the precipitate settles within the cone, due no doubt to the direction of the flow being downward. When exhaust steam from pumps or engines is run into the purifier, a series of condensing pipes is used and the water of condensation is introduced at the top of the cone beneath the small conical cap.

The lime-water saturator consists of a small tank, also provided with a conical bottom and dump valve. At the bottom of this tank are paddles which are driven by the water wheel through a system of shafting and bevel gears. The lime is placed on a grating near the top of the saturator, where it is slacked and falls to the bottom through a large pipe. Soft or purified water is used in dissolving the lime, and this water is raised by a lift wheel having cycloidal arms which dip up the water and deliver it through the hollow shaft to a box which is kept at a constant level and full to the overflow. This water lift is driven from the main shaft by a chain belt and runs continuously. The soft water in this box enters the pipe to the lime saturator through a slot near the end of a branch pipe which can be raised and lowered. When the pipe is raised so that the opening is near the surface, a small amount of water passes to the saturator and the quantity delivered is increased by lowering this pipe beneath the surface. The lime solution passes from the saturator to the chamber at the top of the cone through a trough, so that the lime solution which leaves the saturator is equal in amount to the soft water delivered to the saturator. The amount of lime solution delivered to the purifier is thus regulated by raising and lowering the branch pipe in the soft water box.

There are two large soda tanks, either of which can be used, which deliver the soda solution into a box alongside

Kennicott Water Softener—Union Pacific R. R.

the water wheel; the level of the solution in this box is kept constant by a float which operates a valve in the pipe from the soda tanks. This box also has a pipe leading from it to the chamber at the top of the cone and the solution enters through a slot in the end of a branch which can be raised or submerged, regulating the amount of soda solution delivered.

The automatic regulation is quite simple. A float on the surface of the purified water regulates a valve in the supply pipe leading from the pumps, and so governs the working of the apparatus in accordance with the demand. In turn, the amount of lime and soda solution delivered to the apparatus is governed by the amount of the supply water furnished. The supply water leaves the hard water box through a slot in the bottom and an increase in the amount of water delivered to the apparatus raises the water level in the hard water box and consequently raises its float. This movement, through chains and pulleys, lowers the ends of the delivery pipes in the soft water box and in the soda solution box, until the ends of those pipes are below the surface a distance equal to the head of water above the slot in the hard water box. In this way a given proportion of chemicals to water can be maintained automatically for a wide range of working. The openings in the hard water box, soft water delivery pipe and soda solution pipe are proportioned to deliver the proper amount of chemicals to suit the water; the regulating apparatus maintains equal heads above all three openings.

Since writing the above, we have received the following additional information from Mr. W. S. Robinson, Chemist and Engineer of Tests of the Union Pacific. The plant is now treating 150,000 gals. of water in 24 hours, for which 57 lbs. of soda ash and 1½ bbls. of lime are used daily. The regular pumper renews the lime supply every three hours and the soda ash every 24 hours. A sample of the water is taken each week from the roadside tank and sent to the laboratory at Omaha for analysis. This furnishes a record of performance and is a check on any changes that may take place. The following shows the average results of three months' working, the figures referring to the amounts of scale-forming materials.

	Grains Per Gallon.	Pounds Per 1,000 Gallons.
Before treatment	18.0	2.571
After treatment	5.2	0.743
Amount removed	12.8	1.828

The Park Avenue (New York) Tunnel.

Nine directors of the New York Central recently sent to the Mayor of the City of New York a letter concerning the effort to get legislation to compel them to discontinue the use of steam in the Park Avenue Tunnel. Extracts from that letter follow:

We are informed that you have given your support to the Wainwright bill, now pending in the Assembly, the object of which is to name a fixed date on and after which the use of steam in the Park Avenue Tunnel shall be forbidden. If it were practicable to do this there would be no call for such legislation, for this company is as anxious as the public to operate all its trains through the tunnel by electric power.

In the present stage of the electric art, however, we are advised that this is not practicable as to our heavy through trains. The magnitude of the passenger traffic in and out of the Grand Central Station adds materially to the difficulty of every aspect of the problem. An average of more than 500 trains and about 40,000 passengers daily are now handled. It is essential under such conditions that no uncertain experiments should be tried.

As to the suburban traffic, however, by the use of the side tracks in the tunnels it is practicable to substitute electricity for steam under the plan proposed by the company, by means of a loop. . . . The company is ready to undertake this work as soon as the requisite consents from State and municipal authorities are obtained. Under the circumstances we respectfully submit that it is not reasonable to require the total abandonment of steam in the tunnel by a date to be fixed by the Legislature. The problem to be solved involves too many elements of uncertainty to make such a procedure reasonable where such vast interests are involved.

In lieu of such legislative action the company herewith pledges to the city its good faith to proceed with the substitution of electricity for steam upon the side tracks immediately upon the grant to the company of the necessary authority to do so, and to carry the work forward as rapidly as possible. In addition, this company also pledges itself to substitute electricity for steam in the operation of the central tracks, as soon as and whenever a practical plan can be prepared which gives reasonable promise of producing satisfactory results. This pledge on the part of the company is intended to carry with it the good faith of the individual directors who compose its board.

We are also informed that you have criticized this company for maintaining seven grade crossings at the "S" near Kingsbridge north of the Harlem and have expressed the opinion that this condition of things ought to be immediately remedied at the expense of the company. We are prepared, and it is one purpose of this letter, to give the city the assurance that this company will take immediate steps to do away with these grade crossings at the expense of the railroad corporation. This work will be done as rapidly as a practicable plan can be completed for carrying it out.

The company hopes that you will agree to a bill which shall confer the necessary authority upon the State Railroad Commission to determine the plans for the necessary changes. Should such changes involve the use of streets, avenues, or other property of the city, the company is willing to pay reasonable compensation therefor.

The Mayor of New York has sent to the Chairman of the Assembly Railroad Committee at Albany a letter, some extracts from which follow:

This subject divides itself into two parts; first, the question of fixing a date by which such change of power shall be completed; and second, the method by which the plans necessary to accomplish this result shall be carried into effect.

The public are determined that a change must be made as promptly as possible, from steam to electricity, or to some other equally unobjectionable power. Three interests are to be harmonized: First, the demand that a change of power shall be made; second, the special interests of the city, including those of the property owners immediately affected; third, the demand of the traveling public for adequate facilities. Under these circumstances I am prepared

to assent to Assembly bill No. 1417, known as the Apgar bill, which fixes May 1, 1905, as the day when the use of steam in the tunnel shall cease, but which grants to the State Board of Railroad Commissioners, "upon reasonable cause being shown and upon proper proof that the work of changing the motive power in said tunnel has been diligently, and in good faith, progressed," the power to "extend the time during which trains may be operated by steam locomotives in said tunnel, either in whole or in part."

If the railroad company were unwilling to make the desired changes, I should continue to urge the fixing of a date that should stand as a mandate of the Legislature, but in view of the letter already made public, addressed to me by the President and Board of Directors of the railroad company, I believe that the Apgar bill is in a form well calculated to assure the desired results. If the Legislature sees fit to go further in the matter of a date I shall not object, but personally I believe it to be better judgment to take the company at its word.

As to the rest I submit herewith as a substitute for Assembly bill No. 1124, and ask for its introduction, a bill which provides for the following procedure:

First, the railroad company shall make an earnest effort to agree with the city upon acceptable plans and upon a satisfactory equivalent for privileges granted and for city property taken. In the event of such agreement, the plans are to be submitted for approval or rejection to the State Board of Railroad Commissioners. If approved by this commission, the bill provides for the necessary condemnation of property and the immediate execution of the plans thus approved. If the plans are rejected by the Railroad Commission the railroad company must start again. If, on the other hand, the railroad company and the city cannot agree upon the plans, there is an appeal open to both parties to the State Board of Railroad Commissioners; and in the event of continued disagreement further appeal may be taken by the city to the Appellate Division of the Supreme Court, First Department, whose decision will be final. If the railroad company and the city agree upon the plans, but fail to agree upon the equivalent to be given to the city, then the courts in the last resort are to determine the compensation.

The bill also provides that an agreement must be reached between the railroad company and the city within sixty days after the plans are submitted to the city, or else the city shall be deemed to have disapproved the plans. By this provision the public demand that the desired changes shall be brought about as quickly as possible will be given full force and effect. In the meanwhile, in the event of disagreement, both the railroad company and the city have two appeals; first, to the State Board of Railroad Commissioners; second, to the Appellate Division.

Property owners affected will have a hearing as to any proposed plans by the city, and again by the State Board of Railroad Commissioners; and, in the event of disagreement between the railroad company and the city, by the said Appellate Division of the Supreme Court. In the event of the condemnation of their property, after plans have been approved, the usual procedure will be followed.

The Berlin-Naples express, which began running Jan. 16 last, leaves Berlin at 10 a.m., Mondays and Thursdays, passes Munich at 8:10 p.m., crosses the Alps by the Brenner Pass, arrives the next day at noon at Florence, at Rome 5:37 p.m., and at Naples 10:30 p.m. This is a great improvement on the facilities heretofore. It is a limited train with dining and sleeping cars, on which only first-class passengers are carried, with a charge of about ⅞ per cent. per mile for the sleeping car company. The custom-house inspection of baggage is made on the train. Once in two weeks one of the sleeping cars of this train is carried through to Palermo, going down the west coast of the Peninsula to Reggio, crossing the straits by car ferry to Messina, and thence along the north coast of Sicily—perhaps the most beautiful railroad route in the world, though a large part of this journey is by night.

Freight Yards of the Chicago Transfer & Clearing Co.

In our issue of March 8, last year, we published an outline of the work done up to that time on the new freight yards of the Chicago Transfer & Clearing Co., at Chicago, together with the proposed plan of the yard. In April, however, the plan now shown was substituted and this yard is nearing completion. The drainage system, water system, grading and track work are all finished and the work on the roundhouse, coaling station, power house equipment and signal and lighting systems is well under way. Doubtless everything included in the plans now shown will be completed by early spring. The company will then have an immense railroad switching yard connected by the belt and switching roads with all railroads entering Chicago. Beyond this point the plans of the company are not definitely made. The company now owns 3,700 acres of land, so there is ample room for duplicating the present yard several times, and still provide for warehouses, grain elevators and manufacturing sites when they are needed. The present article will only deal with the work now in hand.

The land owned by the company is bounded on the north by the projection of Sixty-third street and on the south by Seventy-ninth street projected, this tract being about 7½ miles west of the Lake. On the east side of this land is the Chicago & Western Indiana R. R., and on the west side are the Chicago Junction Ry. and the Chicago Terminal Transfer R. R., all three being belt and switching roads. One corner of the company's land extends to the Drainage Canal and Illinois & Michigan Canal. The whole tract is practically a level prairie, most of it being just outside of the city limits. It will soon be possible to reach the yard from the city by an electric car line now building.

General Plan.—The plan shown last spring was for a yard to be worked from a gravity mound in one direction only. That is, the receiving yard was on one side of the mound and the classification yard on the opposite side. However, the yard as built is essentially different and can be worked in either direction from the mound or in both directions at a time.

The general scheme is best shown by Fig. 1. The gravity mound carrying five tracks, connected by leaders and cross-overs, is at the center with the same grades and similar track arrangements either side of the summit. The mound tracks lead into the double ladders of the two classification yards B B, one either side of the mound, and each track of these yards is 2,400 ft. long. Each set of classification tracks covers the full width of the yard. The receiving yards C C, are on the general level, one being on either side of the gravity mound, with double ladders parallel to the classification ladders. The length of the receiving tracks varies from 1,600 to 3,000 ft. Tracks D D, at the outer ends of the classification yards are overflow tracks to be used in case the classification tracks are full. The space left vacant beyond the west classification yard is reserved for such purposes as repair tracks, storage tracks, icing houses and transfer houses. The whole yard north and south is 660 ft. wide, and the greatest number of parallel tracks is 49.

The three outer tracks on both the north and south sides of the yard are thoroughfare tracks joined by double-track Y connections to the switching roads on the east and west. A through track also extends straight through the middle of the yard to the roundhouse at the east end. The receiving and classification tracks are spaced 13.5 ft. center to center, and this spacing is maintained throughout, excepting that the outer thoroughfare track is 15 ft. center to center with the second thoroughfare, and the second and third thoroughfare tracks are 14 ft. centers.

Each of the two receiving yards has capacity for 540 cars, each of the two classification yards 2,580 cars, and each of the four sets of overflow tracks has capacity for 188 cars. In all there are now laid 105 miles of track and the grading is finished for 25 miles of additional tracks for overflow and storage purposes.

A brick subway under the gravity mound is provided for passage between the two receiving yards. The power house and office building are directly north of the gravity mound, and on the summit of the mound is a bridge supporting the signal tower, from which all the switches on the classification ladders are operated. It will be noticed that the offices, power house and signal tower are thus brought close together.

Operation.—By reference to Fig. 2, it will be seen that trains may enter from either end of the yard, over the Y connections with the belt roads and proceed on the outer thoroughfare tracks to one of the two receiving yards. The locomotive is then cut off and for a return load takes a train from one of the tracks in the classification yard, those ladders of the classification yards farthest from the gravity mound being used for this movement.

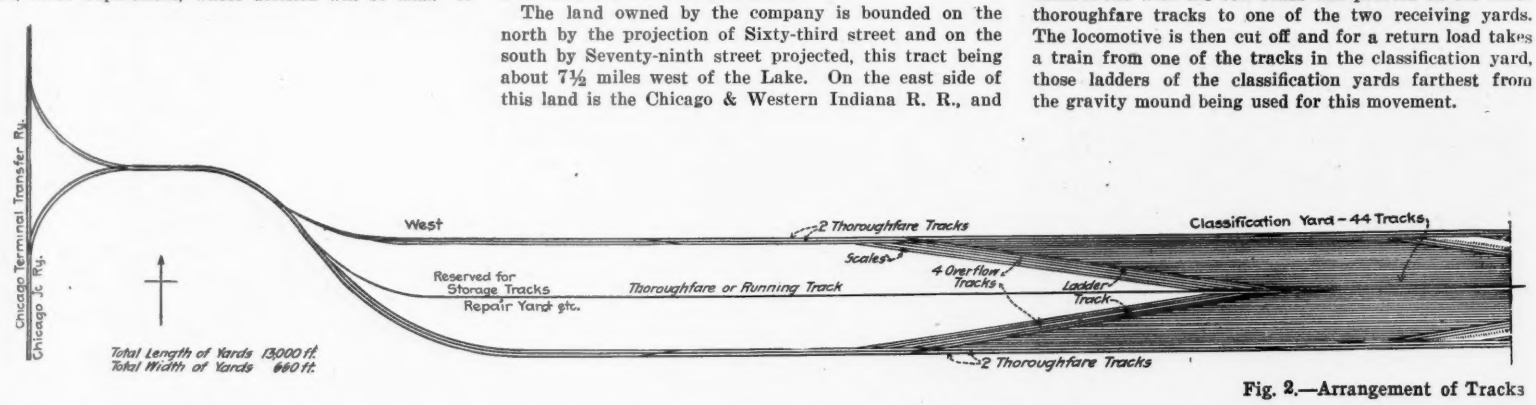


Fig. 2.—Arrangement of Tracks

Trains are taken from the receiving tracks by the regular yard engines, backing up on the inner thoroughfare track until the switch to one of the drilling tracks is cleared; then the train is pushed up a drilling track, outside and parallel to the double classification ladders. It will be seen from Fig. 2 that leaders from two of the drilling tracks cross all five tracks on the gravity mound and are connected to these tracks by slip switches. By means of these leaders and the cross-overs, a train can be switched to the east and one to the west over the gravity mound without interference. The couplers between cuts of cars are unlocked upon approaching the summit and as they go over the summit the cuts separate from the train and run into the middle mound track, then into one of the two classification ladders and then into one of the classification tracks. The poling track just outside each classification ladder is provided so that when cars stop short in bad weather they can be assisted by poling.

It is intended that at the most two switching movements over the mound will classify trains for the various roads so that the cars will be in any desired order; such as loads and empties, coal and merchandise, or division order. The train as received will be first pushed over the mound in one direction, and all cars going out over the switching road at that end of the yard will be classified in their final order. All cars going out over the switching

From West End, South Receiving Yard.

View of Hump, Looking East.

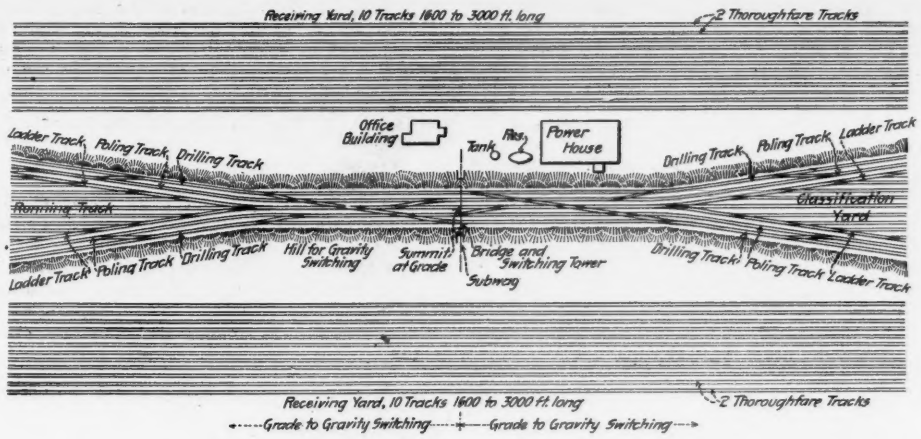


Fig. 1.—Top of Gravity Mound in Center of Yard.

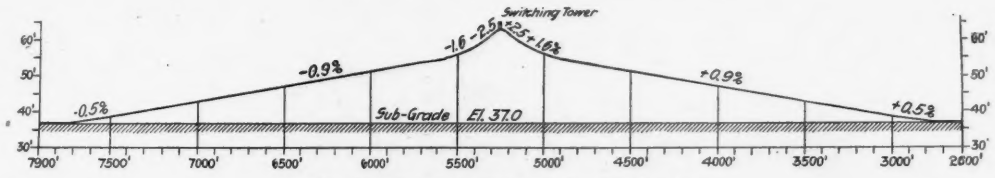
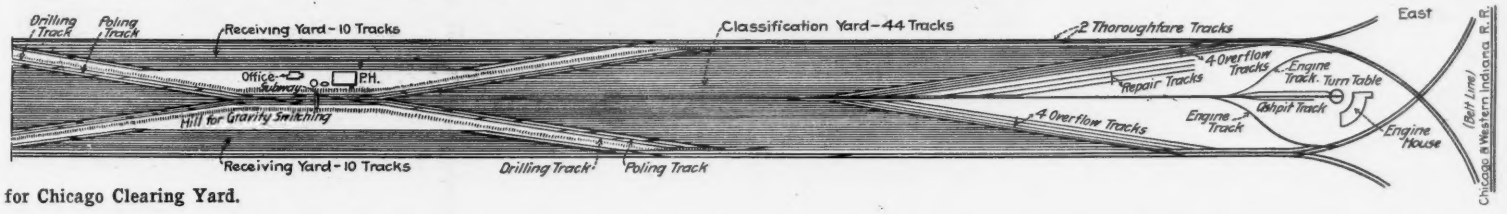


Fig. 3.—Plan and Profile of Gravity Mound.

(The grades are the same both sides of the summit.)

road at the opposite end of the yard will be dropped in one or more tracks until a string of cars accumulates. This string of cars will then be pushed over the mound in the opposite direction and classified in final order.

For returning the brakemen to the summit of the mound a light locomotive will be used running on the middle thoroughfare track or on the outer tracks at the sides of the classification yards. On the tracks near the



for Chicago Clearing Yard.

middle of the yard, it is expected to stop cars in the upper part of the classification yards, and then drop the cars down from time to time as they accumulate, the grades on these tracks being sufficient to start cars simply by releasing the brakes. This will shorten the trip of the men who brake cars down from the summit of the mound and enable them to get back quickly. On the outer classification tracks where there is a long stretch of level track, the men stationed at the lower end of the yard will doubtless be able to catch the cars, so they will not have to be ridden the whole length of the yard.

Six switching locomotives are now building for regular use in the yard, four consolidation and two six-wheel engines. The consolidations will weigh about 185,000 lbs. with 170,000 lbs. on the drivers, and the six-wheelers will weigh about 120,000 lbs.

The grades on the gravity mound are clearly shown by the plan and profile in Fig. 3.

Of about 422 switches in the whole yard, 120 switches along the ladders of the classification tracks are operated from the signal tower above the gravity mound. The electro-pneumatic system of the Union Switch & Signal Co. has been used, the 120 switches being operated by 10 push-button machines. The buttons are arranged in two rows, the upper row being the "normal" and the lower the "reverse," corresponding to the positions taken by the switches when the buttons are pushed. Above the push-buttons is a row of indicators electrically connected with the several switches and the insulated track sections embraced within the clearance limits of each switch. Normally, or when the ladder is clear, the indicator shows white, but when there is a car within the block section or the switch has not completed its stroke the indicator shows red. These indicators guide the operator in the working of the switches and show him the location of cars on the ladders.

Drainage and Track.—The ground where the yard is located is 35 ft. above Chicago datum, but, being perfectly level, the first work was to build a sewer system draining the whole tract into the Illinois & Michigan Canal. The main sewer begins at the extreme east end of the yard and runs west along the north side of the yard with 19 lateral sewers, one every 660 ft. It starts with 18-in. vitrified pipe and is enlarged until the last mile and a half is a 7½-ft. concrete sewer, with a 1-ft. circular shell. The cement for this work was furnished by the Illinois Steel Co. In its length of 4½ miles the fall is 22 ft. There are about 12 miles of drain pipe laterals varying from 8 to 15 in. in diam.

The yards are raised 2 ft. above the surrounding level with sand, about 1,200,000 cu. yds. of sand being used for this filling. Above this is a layer of slag from 6 to 8 in. thick, upon which the ties are laid and ballasted with gravel and cinders. The gravity mound required 400,000 cu. ft. of sand filling. New 75-lb. rails of standard A. S. C. E. section are used throughout. Oak ties are used in the thoroughfare and gravity tracks, but in the receiving tracks and level portions of the classification tracks the ties are cedar, laid 2,800 to the mile. All the switches have reinforced points and are made unusually strong to stand heavy service, being especially designed by the Chief Engineer of the Company, Mr. A. W. Swanitz and built by the Cleveland Frog & Crossing Co.

Power House.—The power house is a fine fire-proof building, handsomely finished inside and well equipped. The walls are brick with stone trimmings. Steel trusses, extending from wall to wall, support the tile roof and leave the floor unobstructed by posts. A brick wall divides the engine room from the boiler room.

The engine room is 67 x 74 ft. floored with hard red tile. The walls have a wainscoting of white enamel brick, above which they are plastered with cement, smooth finished and painted. The boiler room is also 67 x 74 ft. and contains a battery of three 300-h.p. Babcock & Wilcox water-tube boilers with pressed brick settings. Room is provided for future extension of the boiler plant. Beneath the engine room there is a basement, 8 ft. high, finished with cement floors, in one end of which are elaborate toilet rooms and bath rooms for the men.

In the engine room are two 150-k.w. General Electric three-phase generators, direct-connected to Ideal engines. The voltage at the generators is 2,300 volts and current is transmitted at this pressure to various points in the yard, where it is reduced by transformers to 110 volts for lighting and power circuits. In addition to lighting the buildings, the gravity tracks will be lighted by arc lamps and about 425 switch lamps in the yard will be lighted by 8 candle-power incandescent lamps. The arc lamps along the classification ladders are mounted on poles spaced 300 ft. apart, and these lights are shaded on the side toward the signal tower to protect the eyes of the tower men and the brakemen riding cars. The switch lamps are in four circuits from the power house, and instruments are installed on each circuit for indicating whether any of the lamps are burned out.

There are three Rand air compressors. A cross-compound compressor with a capacity for 1,196 cu. ft. of free air a minute will deliver air at 100 lbs. pressure for lifting water from artesian wells, working the electro-pneumatic switches, and supplying the roundhouse. A second compressor of 950 cu. ft. capacity is for use when it is necessary to shut down the first compressor. A third compressor has a capacity of 800 cu. ft. a minute and will deliver air at 800 lbs. pressure for operating air trucks and other machinery in a transfer house to be built later. There are also pumps for raising water into the large storage tank, and for use in case of fire.

The water for the power house and yard mains comes from three artesian wells about 1,600 ft. deep. These wells upon test have yielded 1,400 gals. of water a minute. The water is brought to the surface by compressed air and flows into a reservoir beneath the elevated tank. Pumps lift the water to this tank, which has a capacity of 100,000 gals., and the bottom is a little over 60 ft. from the ground. A system of water mains runs throughout the yard, there being in all about 12 miles of pipe varying from 8 to 12 in. in diam. When required the tank valve can be closed and direct pressure put on the mains by the fire pumps.

Roundhouse and Terminal Facilities.—The roundhouse and facilities for caring for locomotives are at the east end of the yard. The roundhouse now building will be one-fourth of a circle and have nine stalls, facing a 70-ft. turntable. The design of the house and its equipment is very modern. The roof is supported at the front on cast-iron posts, mounted on concrete foundations. The pits and roundhouse floors are concrete and the house is equipped with water and the Sturtevant sys-

Looking West from Signal Tower.

Looking East from Signal Tower.

tem of heating by hot air. The turntable pit and walls are also concrete.

The coaling station was built by Fairbanks, Morse & Co. and has two 40-ton pockets, with a storage bin under each capable of holding about 50 tons of coal. Each pocket has a weighing device which shows the amount of coal in the pocket, from which readings the amount of coal taken by an engine is determined. The coal is dumped or shoveled from cars into a receiving pit and is elevated by a chain belt, carrying steel buckets, to the coal pockets or to the storage bins. A 10-h.p. electric motor drives the elevator and conveying machinery. The coal is delivered to tenders by gravity, the gate controlling the flow of coal being operated by the man on the tender.

In addition to the drawings to which special reference is made, a number of photographic views of the yard are shown which probably give the best idea of its great size and general appearance. The engineering and construction work has been done under the direction of Mr. A. W. Swanitz, the Chief Engineer of the Company, and we are indebted to him for much in the preparation of this article.

Highway Bridges on the Pennsylvania Railroad.

The engravings show two standard highway bridges of the Pennsylvania Railroad and these engravings explain themselves. We publish them as examples which may be suggestive and useful to those who are charged with the design of such structures, they being the fruit of a great deal of experience.

The Hudson River Tunnel.

The New York & Jersey Railroad Company was incorporated a few weeks ago to take over and complete the old Hudson River Tunnel. A prospectus has been quietly circulated, from which we take the following information:

According to the prospectus, the officers of the company are: William G. McAdoo, President; Walter G. Oakman, President of the Guaranty Trust Company, and Edmund C. Converse, former President of the National Tube Company, Vice-Presidents; Henry A. Murray, Treasurer; Charles W. King, Secretary, and Charles M. Jacobs, Chief Engineer. The directors, besides Mr. Oakman, Mr. Converse and Mr. McAdoo, are: Elbert H. Gary, chairman of the Executive Committee of the United States Steel Corporation; John Skelton Williams, President of the Seaboard Air Line Railway; Anthony N. Brady, chairman of the Board of the Brooklyn Rapid Transit Company; E. F. C. Young, President of the North Jersey Street Railway Company; David Young, President of the Jersey City, Hoboken & Paterson Street Railway Company; John G. McCullough, of Vermont, Director of the Erie Railroad Company; Frederic B. Jennings, of the law firm of Stetson, Jennings and Russell; G. Tracy Rogers, President of the Street Railway Association of the State of New York.

The capital stock of the company is $8,500,000, divided into $3,500,000 of 6 per cent. non-cumulative preferred stock (now issued) and $5,000,000 common stock, also issued. Besides the stock, the company is authorized to issue $7,000,000 of 5 per cent. bonds. Of this amount $4,500,000 5 per cent., first mortgage, 30-year gold bonds, of $1,000 each, bearing interest on Feb. 1 and Aug. 1 and redeemable at 110, at any interest period, have been issued. Of the rest of the authorized bonds, $2,000,000 are reserved for purchase of additional property and $500,000 are reserved for other corporate purposes. The prospectus states that the $4,500,000 of the bonds now issued and all of the preferred and common stock will be used for the acquisition of the property of the Hudson Tunnel Railway Company, and for the completion of the North Tunnel and the approaches on the New Jersey and New York sides, and the equipment of the same with electricity. The mortgage, which secures the bonds already issued, is held by the Guaranty Trust Company as trustee, and the prospectus states that the mortgage will be the first and only lien on all the property of the company.

The Jersey terminal will be in the block in Jersey City bounded by Thirteenth, Fourteenth, Henderson and Provost streets, while the New York terminal will be the west half of the block bounded by Christopher, Tenth, Greenwich and Hudson streets. Connection will be made at grade at these terminals with the cars of the Metropolitan Street Railway and the cars of the North Jersey Street Railway Company and the Jersey City, Hoboken and Paterson Street Railway Company, but those cars cannot be run through; the tunnel is not big enough.

It is the purpose of the company to complete first the North Tunnel. This is to have two tracks. The cars will be of special design.

New Chicago Terminal for Lake Shore & Michigan Southern and Chicago, Rock Island & Pacific.

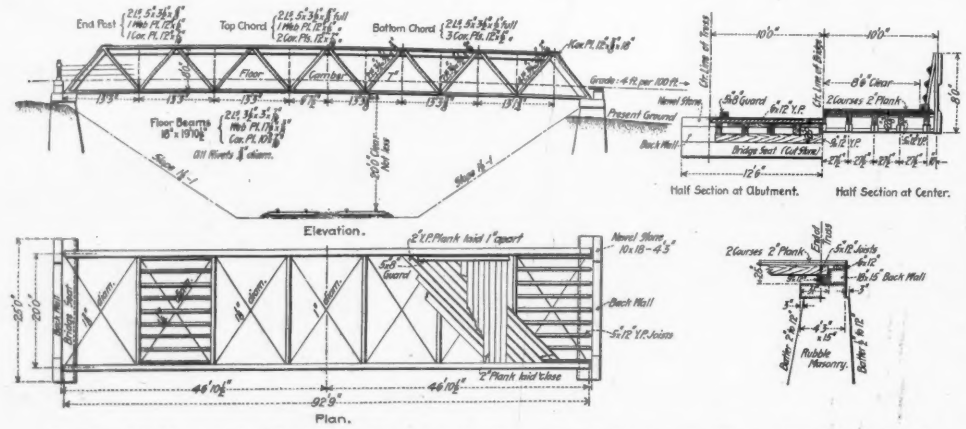
The erection of a fine, new passenger station in Chicago by the Lake Shore & Michigan Southern and Chicago, Rock Island & Pacific will be begun shortly. The new structure is to be upon the site of the old station long used by these roads, and work will commence as soon as the razing of the old building, now well under way, has been completed and the ground cleared. The contractors are the Grace & Hyde Co., Chicago.

New Chicago Terminal Station of the Lake Shore & Michigan Southern and the Chicago, Rock Island & Pacific.

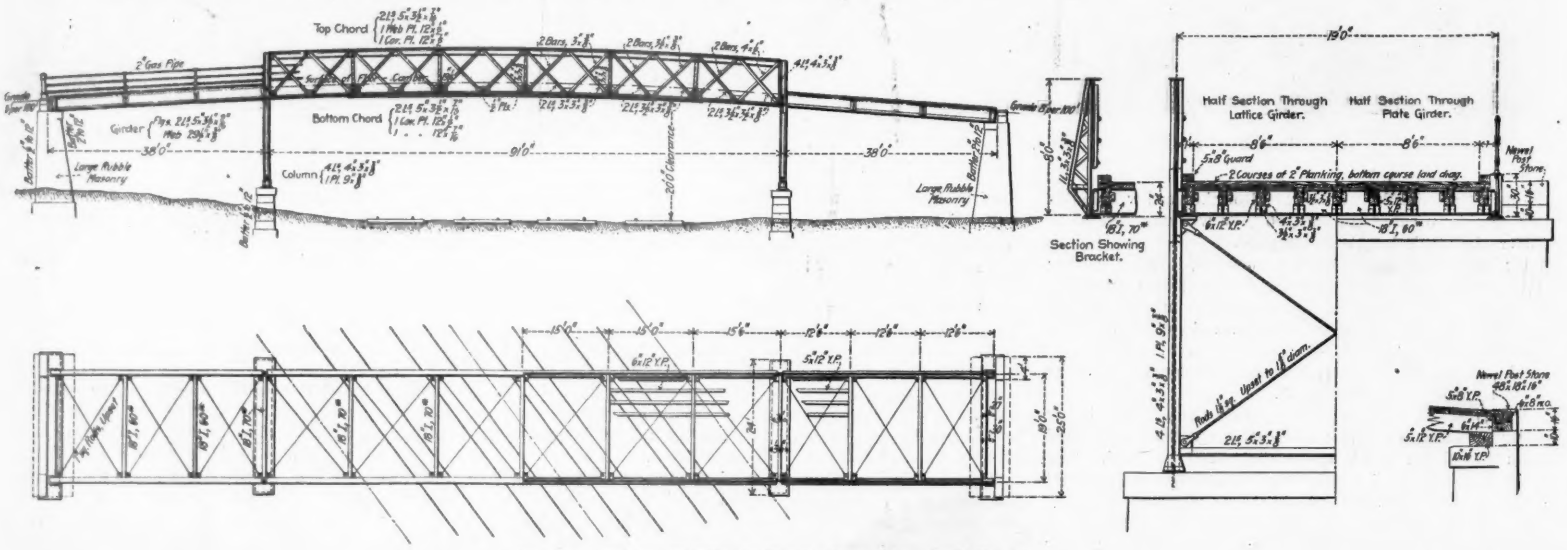
The perspective of the building, which is shown, is from the plans of the architects, Frost & Granger, Chicago. It is to front 215 ft. on Van Buren street, with a depth of 156 ft. 10 in. on La Salle and Sherman (parallel) streets, and will be 10 stories high. The first two stories are to be of granite, and the remaining eight of red paving brick. All trimmings, except the window sills, which will be of terra cotta, are also to be granite. The building is to have a steel grillage foundation, resting on 50-ft. piling driven to hard ground, the piles being spaced 3 ft. between centers.

The plans for the station include the elevation of the 11 tracks entering the train shed. The first floor is at the level of the street and the second at the track level, plans of both floors being shown.

In general, the first floor consists of a main lobby, 96 ft. x 118 ft., occupying the central space, to the west of which is a large dining room, 48 ft. x 72 ft., with the kitchen to the rear, and on the east side the general ticket office, 35 ft. x 58 ft. The entrance hall to the office building is on Van Buren street, just beside and east of the main vestibule. Correspondingly situated, on the opposite side of the main vestibule, is an entrance and stairway leading to the main waiting room on the second floor.



Overhead Bridge on the Harrisburg, Portsmouth, Mount Joy & Lancaster (Pennsylvania) Railroad.



Overhead Bridge, Old Eagle Road—Pennsylvania Railroad.

The space under the elevated tracks will be occupied by the baggage room, the express companies' rooms, and a cab stand. The baggage room will occupy the entire length on the Sherman street side, and the arrangement for checking baggage is made very convenient for passengers, the baggage checking counter being separated from the main lobby only by swinging doors and the necessary space for the accommodation of the public. The cab stand will be on the La Salle street side, next to the building, and from which entrance may be had direct to the main lobby. The comfort of the cab drivers was not overlooked, a waiting room, 20 ft. x 20 ft., opening on to the cab stand, being provided for them.

When passengers desire to pass to the main waiting room on the second floor they may do so, either by the broad staircase at the rear of the main lobby, or by one of the two large elevators which will run between these two floors.

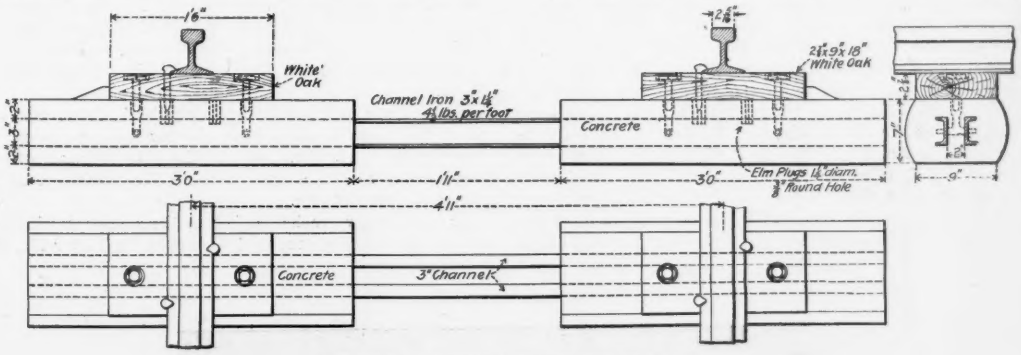
On the second floor, besides the main waiting room, 106 ft. x 108 ft., there will be a separate waiting room for women, 48 ft. x 62 ft., back of which will be a small women's retiring room, and to the rear of this the women's toilet room. The rest of the space on this side will be occupied by a lunch room. On the opposite side will be a smoking room for men, men's toilet room, parcel checking room, news stand, and a small ticket office for the accommodation of such passengers as may not have baggage to look after, and will not therefore be under the necessity of descending to the lower floor. Between the main waiting room and the tracks, separated from the latter by the usual iron fencing, will be the concourse, 46 ft. x 200 ft., with a steel and glass roof. At the east, or La Salle street, end of the concourse a stairway leads direct to a street entrance, so that suburban passengers may pass to and from their trains without going through the station, if they so desire. Passengers from the elevated trains on Van Buren street will have a passage way from the elevated station at the northeast corner of the building direct to the main waiting room.

The intention is to finish the main lobby in enamel brick, and the main waiting room in marble. The smaller rooms on the first and second floors will probably be finished in mahogany and all of the offices in the building in oak. The offices on the eight upper floors will be occupied by the two roads owning the station.

The train shed will be 578 ft. long and 210 ft. wide. The roof trusses will be a single arch, spanning the entire width of the shed. The tracks are to be elevated 16 ft. above the street, and the train floor will be carried on steel plate girders resting on steel columns, spaced 30 ft. apart in the cab stand area, and 15 ft. elsewhere. The train shed foundations will rest upon piles; those for the columns supporting the train floor will be a spread foundation of concrete, having a depth of 14 ft. E. C. and R. M. Shankland, Civil Engineers, Chicago, have the steel work of the train shed and the foundation work in charge.

Kimball's Composite Concrete and Steel Tie.

The engraving shows a cross tie, designed by Mr. G. H. Kimball, Chief Engineer of the Pere Marquette Railroad Company, which was put in track last autumn for experimental use. Late in January Mr. Kimball informed us that the company was then preparing to lay three-quarters of a mile with this tie at the entrance to Bay City, where the track must be maintained under the pavement. The performance of the experimental tie up to that time had been entirely satisfactory.



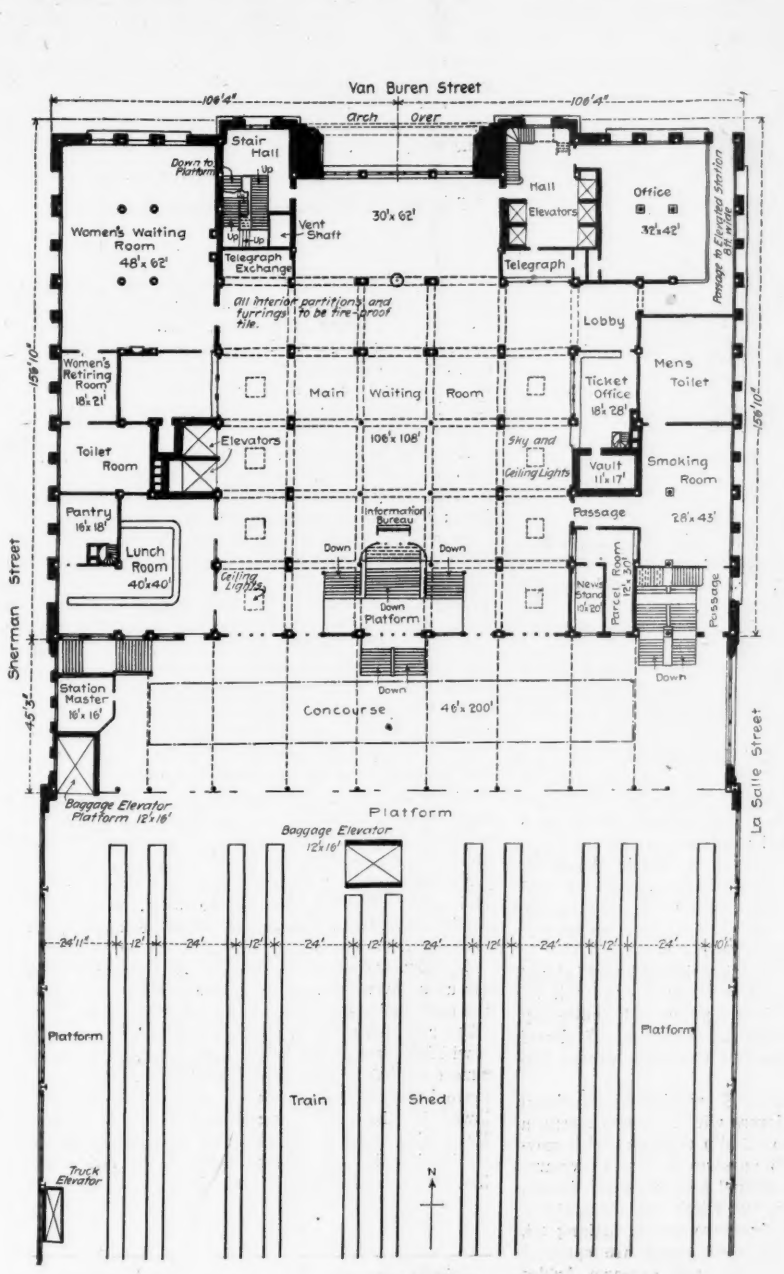
Kimball's Composite Concrete and Steel Tie.

The main members are two channels, 1¼ in. x 3 in., weighing 4 lbs. per ft., spaced about 2 in. back to back, and secured to each other by rivets and thimbles. Around each end of these is moulded a concrete block 7 in. thick, 9 in. wide on the face, and 3 ft. long, the curve of the side being 5.7 in. radius. On these concrete blocks are white oak blocks to carry the rails, although, of course, these blocks may be of any other wood that the local engineer prefers to use.

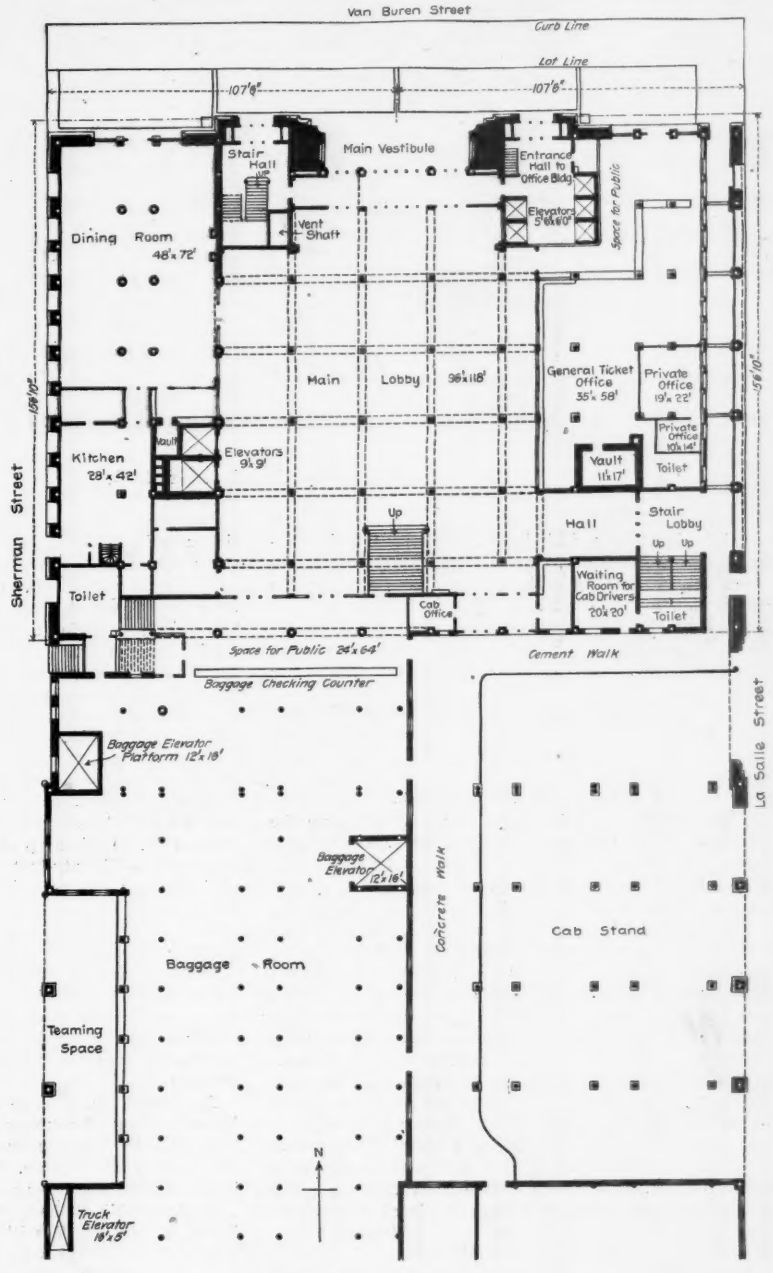
The attachment of these wooden blocks to the concrete is shown in the engraving. Hangers or sockets are moulded into the concrete and into these bolts are screwed which are countersunk in the wooden block. These hangers also serve to space and hold the channels as they enter with a driving fit and have shoulders. Each concrete block has a lug moulded across it as a further support against lateral motion, for the wooden block. Small grooves are made across the concrete under the ends of the wooden blocks to prevent water working in. Plugs of wood are moulded in place in the concrete to receive and guide the points of the spikes, but if the wooden block is thick enough these plugs may be omitted.

The channels are first coated with a wash of pure Portland cement of the best quality to prevent corrosion. The concrete may be made of any material, either sharp sand, gravel or fine stone, and cement. It is suggested that Avenarius Carbolineum be used to preserve the wooden blocks.

The object of the designer has been to secure a permanent tie that can be uniformly tamped without becoming center-bound. Other advantages are, the saving in cost of renewals, and the longer life of the rail due to better surface, particularly at the joints. It is believed that as



Track Floor.



Ground Floor.

Plans of New Van Buren Street Passenger Station, Chicago—C., R. I. & P. and L. S. & M. S.

it will be no longer necessary to break the bed below the tie there will be an advantage in the saving in waste and wear of ballast. It is believed further that there will be increased stability due to the greater weight of the track structure with better surface drainage. This construction gives excellent insulation for bonded track.

The New Pennsylvania Yard at Pittsburgh.

WITH AN INSET.

The yard and the approaches to the terminus of the Pennsylvania Railroad, at Pittsburgh, have been enlarged and entirely reconstructed, in connection with the building of a new union passenger station at that point; and a diagram of the tracks, showing the switches and the signals which are controlled from towers 1, 2, 3 and 4, are shown on Inset No. 1, which accompanies this issue. Fig. 4 is a view of the electro-pneumatic interlocking machine in tower No. 1.

Fig. 1, on the inset, shows the switches controlled by tower No. 2, near Twenty-first street. The top of the drawing is south and the bottom north. The right hand end of Fig. 1 joins the left of Fig. 2, and the right of Fig. 2 joins the left of Fig. 3. The five principal tracks from tower No. 2 (beginning at signals 78, 80, etc.) to tower No. 1 (signals 14, 16, etc.) are controlled from tower No. 1, so that the train director in that tower can, when necessary, use these tracks for movements in either direction. The location of the pneumatic cylinder at each switch is shown by a solid black circular dot and the relative position of the one, two or three switch movements which are worked by each cylinder, is shown by the rectangular figures connected to the round dots.

Fig. 4.—Interior of Tower No. 1.

Work on the installation of these yards was begun in the early summer of 1901 and is now nearing completion—and three-fourths of the most difficult part of it is finished.

This part of Pittsburgh is narrowed between the Allegheny and Monongahela rivers with a great hill, several hundred feet high, occupying most of the available space between the rivers. Level ground for the yards was secured only by cutting away a large portion of this hill on the side toward the Allegheny River, and filling up the site to a height of about 15 ft. above the level of Liberty avenue, which skirts along the yards on the north side. It has been a question of building yards which, though narrow, should provide for the growth of business for years to come. The new work had to be put in without interfering with the constant use of the yards by the 400 trains that daily pass through them. The work has been done literally beneath the wheels of the passing trains, and that it has been completed in a year, without a single fatal wreck and no other accidents of importance, speaks much for the care and skill exercised by those in charge.

Two years were taken for the preparation of the plans for these yards and 40 complete designs were drawn before one was found that was satisfactory in all respects. The contract for the switches and signaling apparatus was given to the Union Switch & Signal Company, of Swissvale, Pa., the amount of the contract being $197,500. The cost of the track-work is placed at $200,000 additional. Completed the new yards will mean an expenditure of considerably over $400,000.

The Union Station yards affected by this change extend from the end of the Panhandle tunnel just west of the station (on the south side) and the Fort Wayne elevated tracks over Liberty avenue (on the north side) eastward to about opposite Twenty-eighth street.

There are twenty parallel tracks in front of the station and of this number fourteen are under the train-shed, which is now building. These tracks fall into three groups, first, on the south side of the station, the freight tracks of the Panhandle and the Monongahela division; second, those in the center, which are the passenger tracks; and, third, those on the Liberty avenue side, which are the Fort Wayne main line and the Duquesne freight station freight tracks.

Outside the sheds, on the Panhandle side, are the eastbound and the westbound freight tracks and a drill track to the Grant freight station. Adjoining these three tracks, but lying under the train-shed are three Panhandle and Monongahela division passenger tracks. Next, to the north, are eight passenger tracks for the Pennsylvania railroad (main line) and the Buffalo & Allegheny Valley division, all ending at the station. Still north of these lie three Fort Wayne passenger tracks and then, outside the shed, are two Fort Wayne freight tracks, and the single track that leads to the Duquesne freight station on the Point.

From Twentieth street to Thirty-third street, against the hillside, lie a series of tracks for storing passenger cars for cleaning. On these tracks care is taken of all the passenger cars, except those of the Buffalo & Allegheny Valley division.

In the twenty tracks leading to the station a "double-ladder" has been so arranged (see opposite Tower No. 1) that a train from any one of the tracks can pass to any other. A double-track slip-crossing is placed at Twentieth street (signals 58, 60, etc., tower 2) and another at Fifteenth street (signals 20, 22, etc., tower 1) by which it is possible to transfer a train from any one track to any other.

Between Twenty-first street and Twenty-ninth street on the hill side are arranged the eastbound classification yards where the trains will be made up. In this yard there are 19 tracks.

Under the old arrangement of the yards there were two signal cabins, one opposite Fourteenth and one opposite Seventeenth street, in the midst of the yards. These are now replaced by four towers, one opposite Fourteenth street (No. 1), close up to the hillside, out of the way; one opposite Twenty-first street (No. 2), in the midst of the tracks; another (No. 3) on the Panhandle side and just west of the station; and a fourth (No. 4) at the corner of Eleventh street and Liberty avenue on the wall for the elevated Fort Wayne tracks.

In Tower No. 1 there are 62 switch levers and 47 signal levers, making a total of 109 working levers, with 22 spare ones: total, 131. These operate 40 double-slip switches with movable points, 21 switches, 47 dwarf signals, 22 one-arm and two two-arm high signals (on bridges).

At Tower No. 2 there are 58 switch and 32 signal levers, making 90 working levers with 24 spare levers, a total of 114. These operate 32 slip crossings with movable points, 28 switches, 15 one-arm and two two-arm bridge signals, one one-arm ground and 35 dwarf signals.

At Tower No. 3 there are 10 switch and seven signal levers, a total of 17, with six spare levers, making 23. Three slip crossings with movable points are operated from this tower; nine switches, one one-arm bridge signal and 11 dwarf signals.

At Tower No. 4 there is one single slip with movable points, nine switches, two one-arm bridge signals, four dwarf signals and one one-arm ground signal.

The total for the four is 75 double slips, one single slip and 66 switches. This is the equivalent of 520 switches. There are altogether 148 signals and 224 levers.

The principal train shed tracks are about 1,000 ft. long, giving room for the longest passenger trains, and there is about 1,000 ft. clear space between the switches of Tower No. 1 and those of Tower No. 2.

In the installation of this work the following amounts of material were used: 970 tons of 100-lb. rails, 4,000 splice bars, 40,000 nut-bolts, 40,000 nut-locks, 100,000 lbs. of spikes, 400 guard rails (100-lb. section), 1,600 tie-plate guard-rail fasteners, 6,000 rail braces, and 50 frogs. The most costly of all the work, however, was the 75 No. 8 slip crossings. There were but five of these in the old yards. These crossings cost $2,000 each, making a total cost on their account of $150,000.

In the new yards eight simultaneous train movements can be made under the station train shed, two on the P. R. R. main line, and two on the Buffalo & Allegheny Valley division tracks in front of the station; two movements on both the Fort Wayne and the Panhandle sides, and also two freight train movements on each side, making possible a total of 16 movements side by side at one time.

A distinctive feature of the yard management is that the train-director in Cabin No. 1 has entire control of the whole yard. No movement in or out of the station by either passenger or freight train can be made until he gives permission.

A complete telephone system has been installed so that the train directors are in immediate communication with any office to which they need to speak. This system has a central exchange of its own. The offices connected with the exchange are those of the four signal cabins, the train despatchers of all the divisions from which trains enter the yards, the station master, the station baggage master, the United States mail transfer clerk, the Adams express office, the passenger yardmaster and the passenger yard at Penn street; the assistant passenger yardmaster at the east end of the train shed, the engine house at Twenty-eighth street, the assistant yardmasters at Towers 3 and 4, the assistant trainmaster at Twenty-eighth street and the whole Union station exchange, by which any number in the Bell system can be reached.

In addition to this, telephone booths have been set up at various points in the yards where a curve obscures the view from the tower in charge of that part, so that a train-director at the tower can call up the man at the outlying telephone booth to ask about the position of a train, or to send him to trainmen nearby with messages. By these telephones inconveniences due to fogs are largely done away with.

Locomotive Sparks—Theoretical Considerations.*

III.

The results of actual observations upon the size of sparks and the extent of area over which they are distributed by moving locomotives, have been presented in the preceding chapter. It is the purpose of the present chapter to discuss the various forces affecting the spread of sparks and to show their relation one to another, so that if certain conditions prevail, the resulting effect can be predicted.

All change of motion is the result of force. . . . The effect of several forces acting at the same time upon a given body was originally stated by Newton as follows: "When any number of forces act simultaneously upon a body, then whether the body be originally at rest or in motion, each force produces exactly the same effect in magnitude and direction as if acting alone." This principle is often called the Law of Independence of Motion. By this law it will be seen that if a body, as for example, a spark, be projected upwards in the presence of a strong wind, it will move upward in response to the initial impulse to a certain height and will then descend. This upward and downward movement will extend over the same vertical distances, and will take the same time as would be the case if the wind were not blowing. On the other hand, a spark thus projected will respond to the influence of the wind throughout the time it remains in the air to the same extent that it would if the force of gravitation were not in action. Being, therefore, under the influence of gravity, which tends to retard or to produce motion in vertical lines, and under the influence of the wind, which tends to produce motion in horizontal lines, the actual path followed will be a curve.

If, now, we assume a body, as A, Fig. 60, held in the air at a given distance from the ground and subject to the action of gravity and to the influence of wind, it will, when released, move in obedience to both of these forces; it will fall through the height h to the ground, and in the time occupied in falling, the wind will have caused it to move horizontally through the distance d, the path followed by the body being described by the curve AB. From this general statement it is possible to express mathematically the relation between the fall h and the horizontal displacement d, which is

$$d = v\sqrt{\frac{2h}{g}}.$$

*Abstracted from advance sheets of a book now in press entitled "Locomotive Sparks," by W. F. M. Goss. To be issued by John Wiley & Sons, 43 East Nineteenth street, New York. See *Railroad Gazette*, Feb. 28 and March

Figure 1.

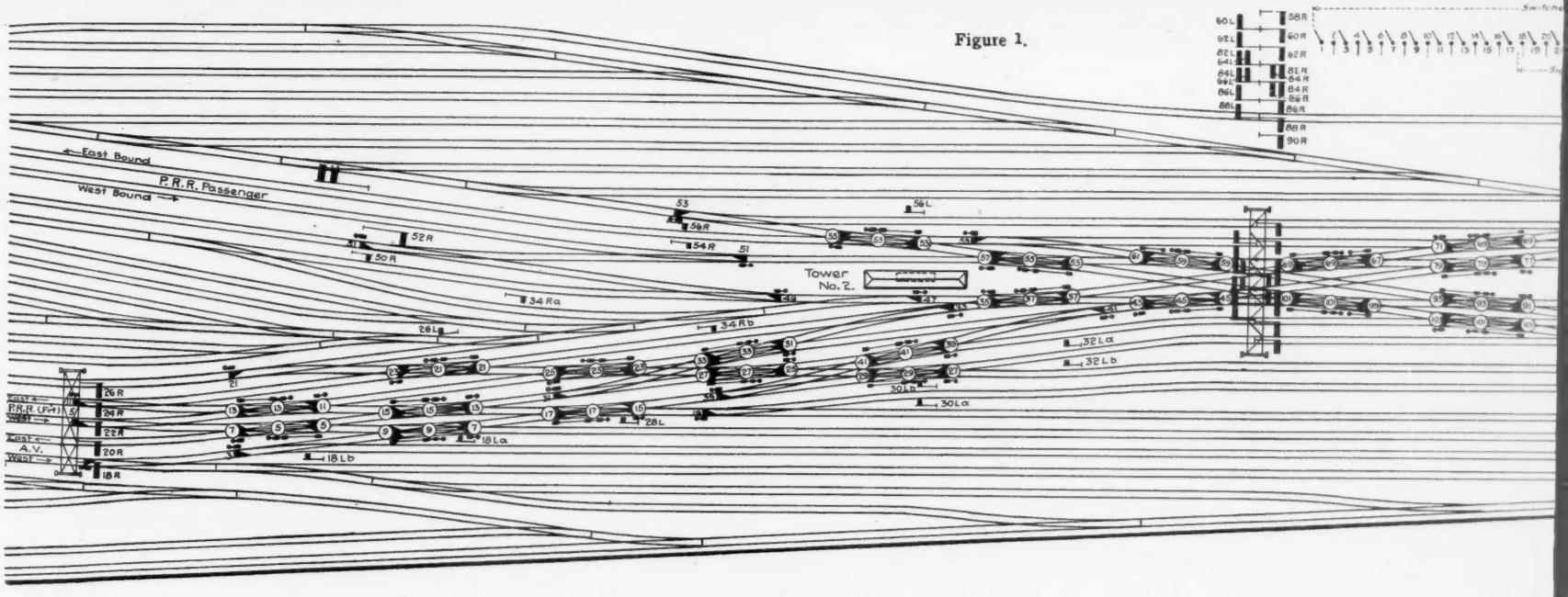


Figure 2.

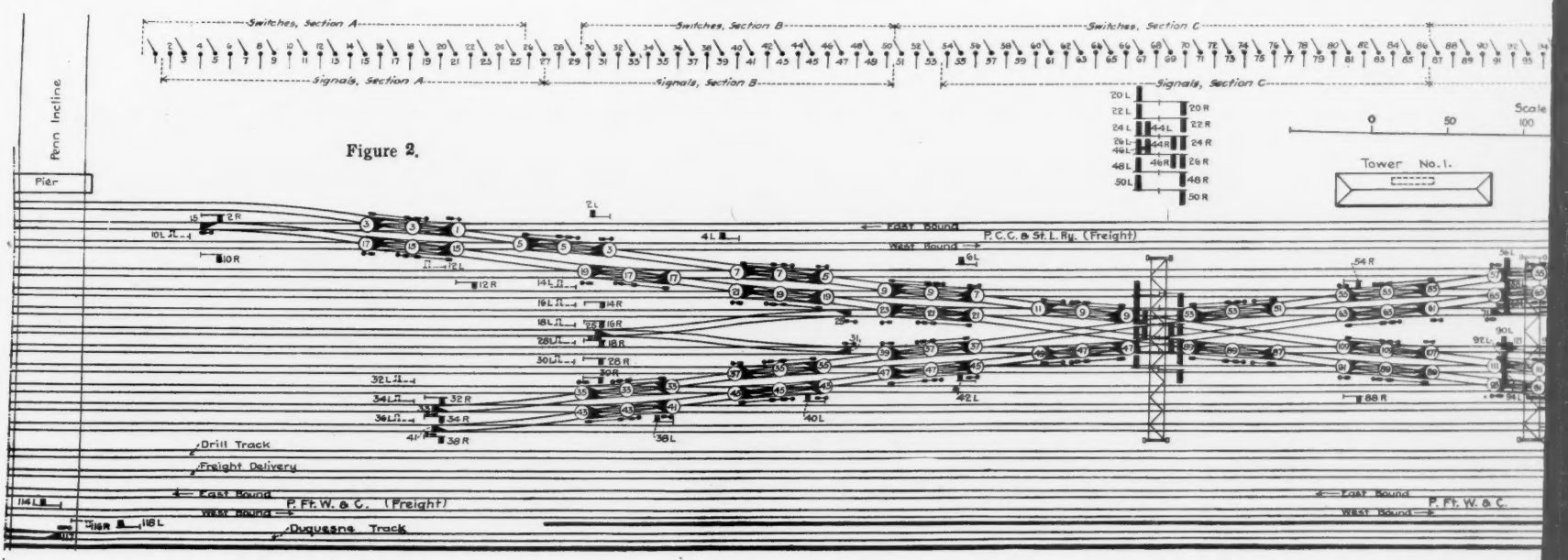
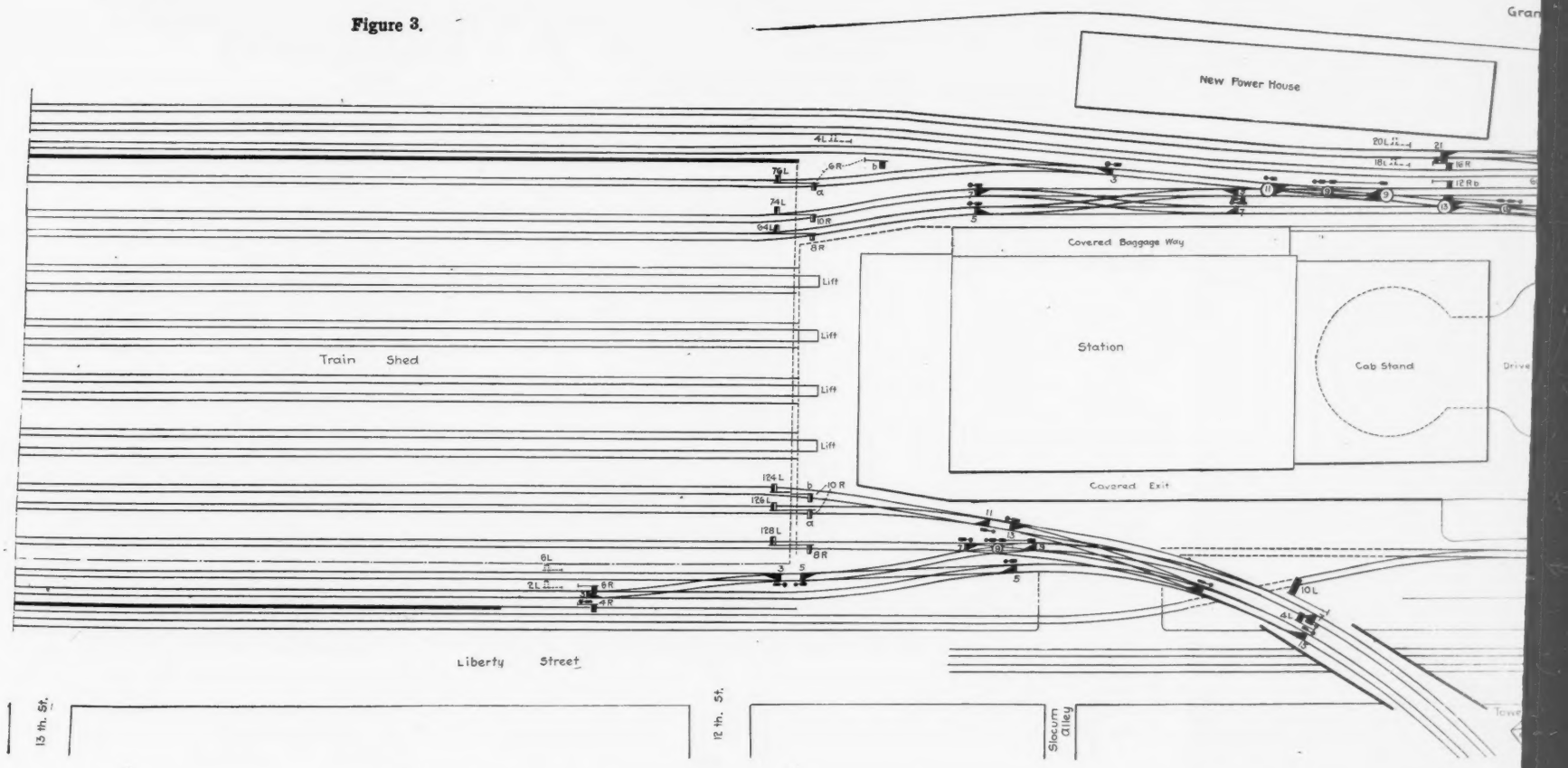


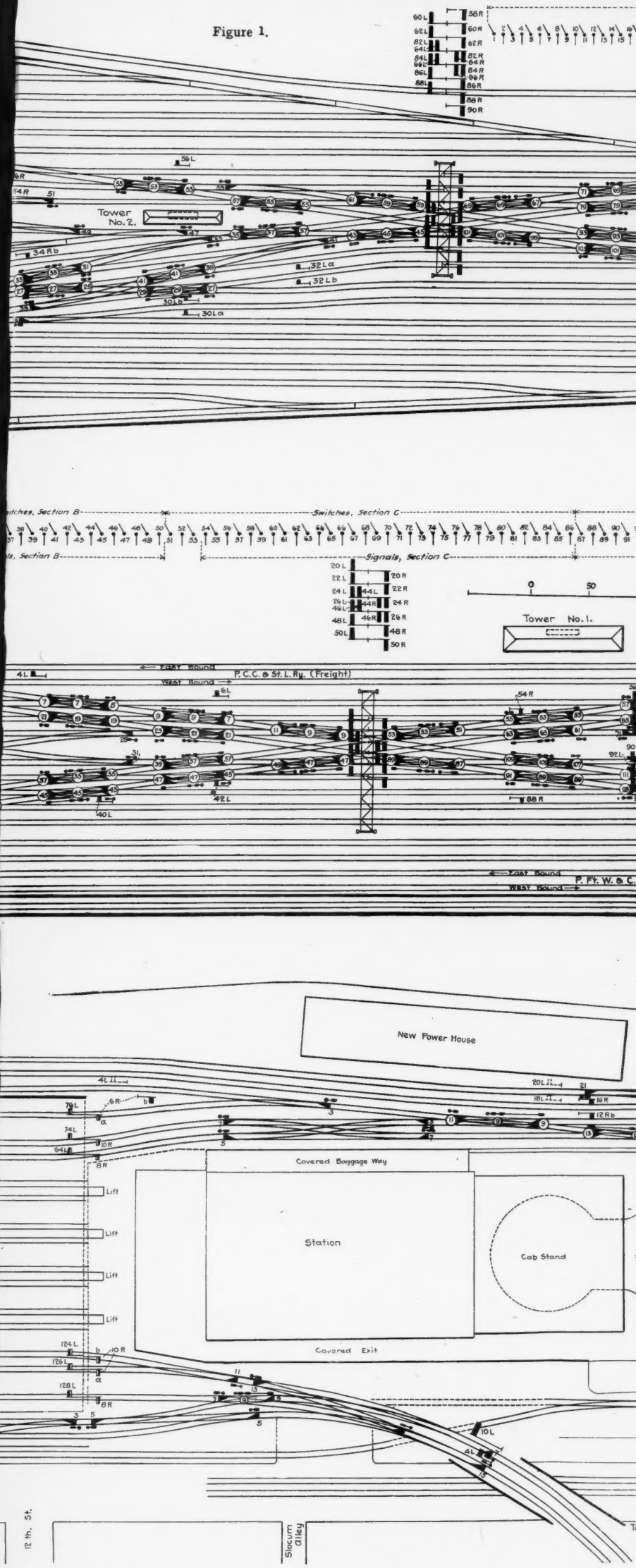
Figure 3.



TERMINAL AND YARD TRACKS OF THE PENNSYLVANIA RAILROAD AT PITTSBURGH; WITH CONNECTIONS TO THE SOUT

Read from left to right, beginning with

Figure 1.



S OF THE PENNSYLVANIA RAILROAD AT PITTSBURGH; WITH CONNECTIONS TO THE SOU

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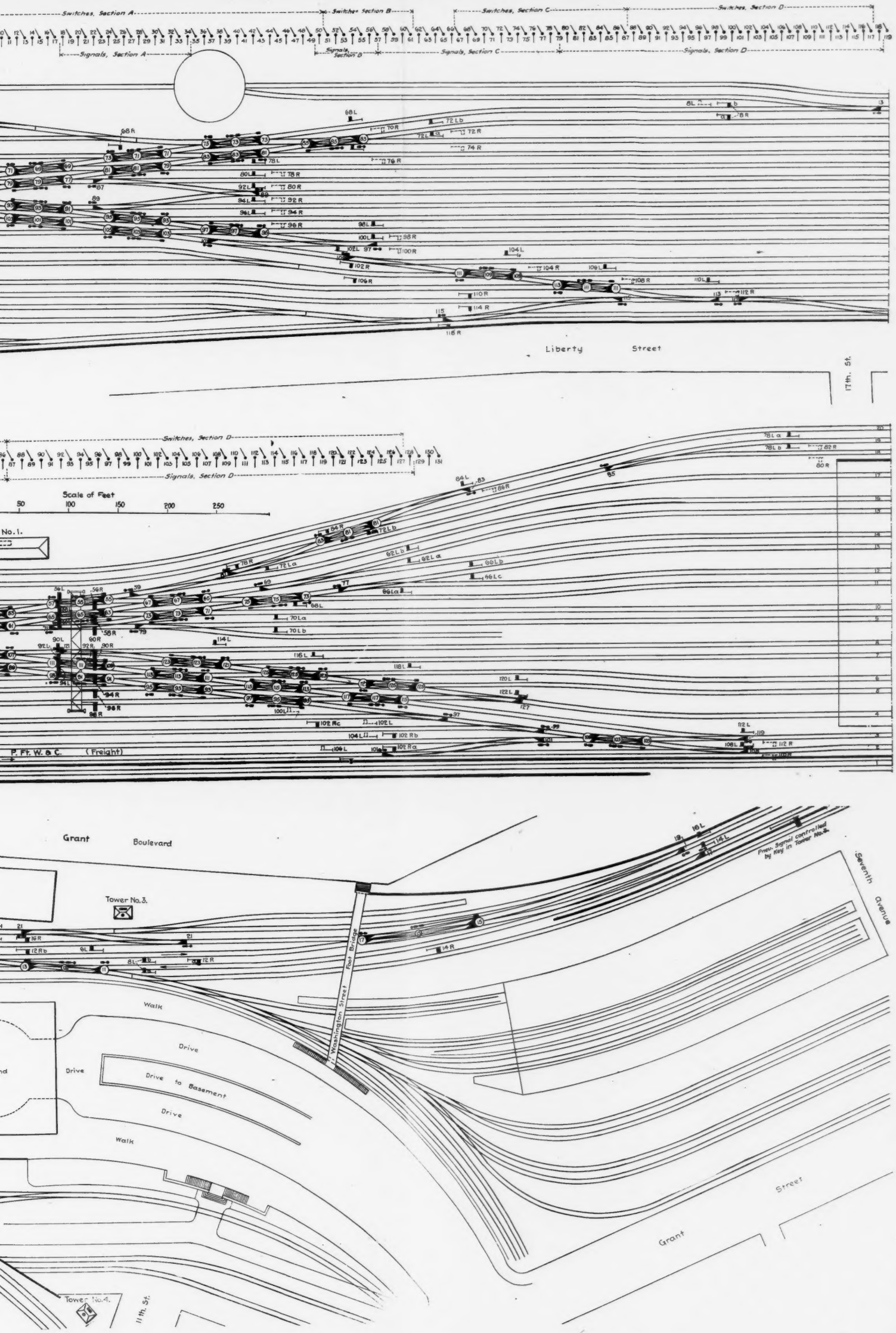
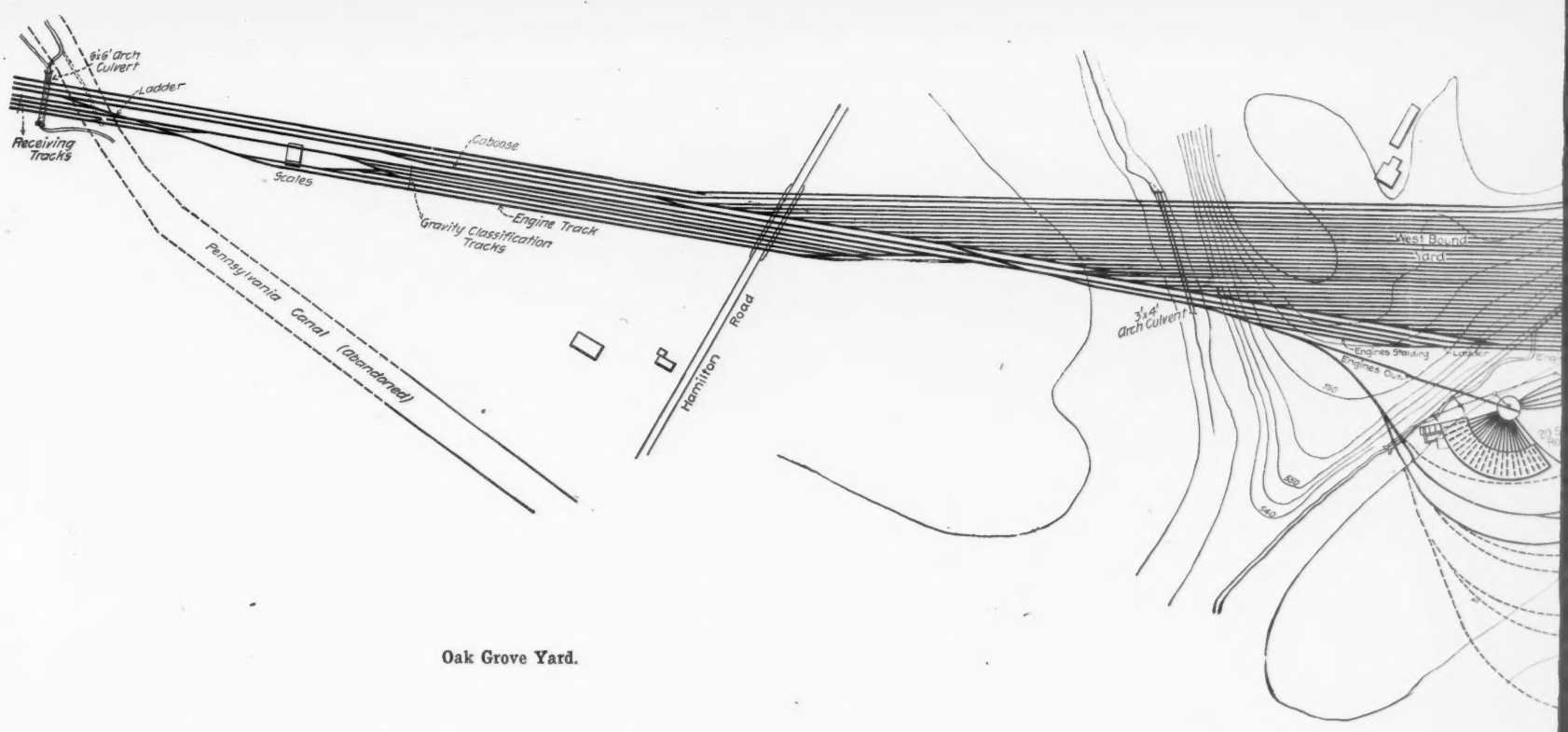
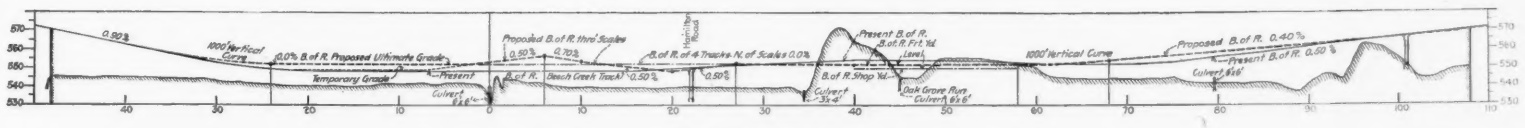


TO THE SOUTHWESTERN LINES (TOWER NO. 3) AND THE NORTHWESTERN LINES (TOWER NO. 4).

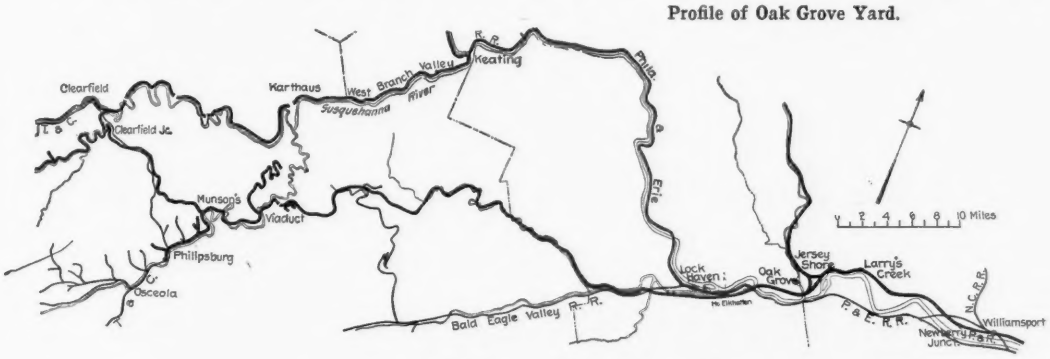
, beginning with Figure 1.



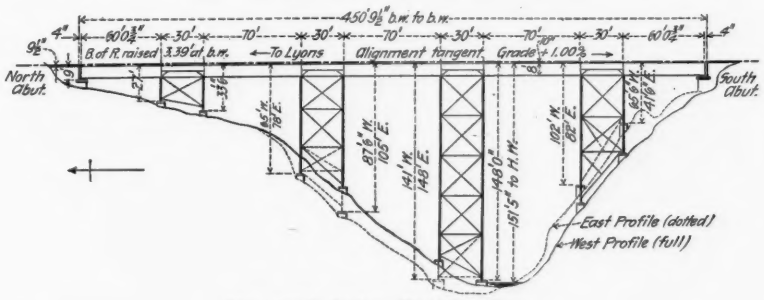
Oak Grove Yard.



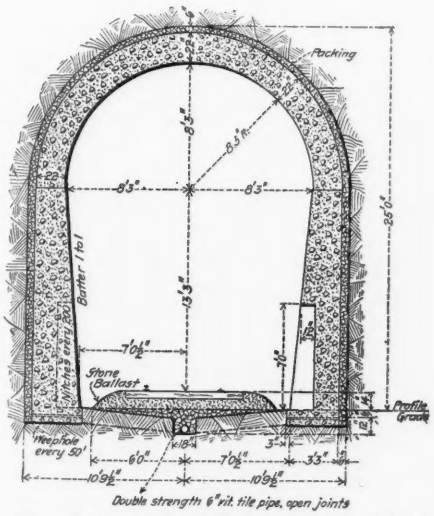
Profile of Oak Grove Yard.



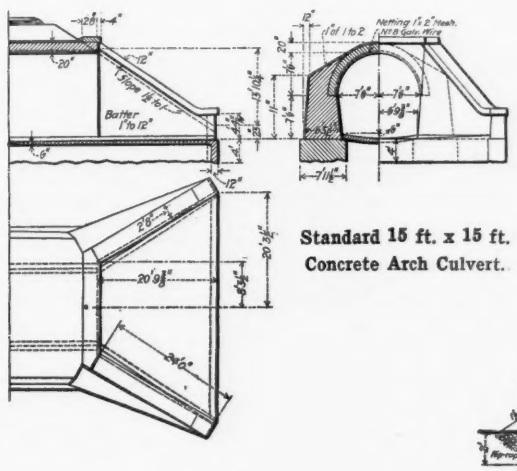
Beech Creek Railroad, Showing Adjacent Lines.



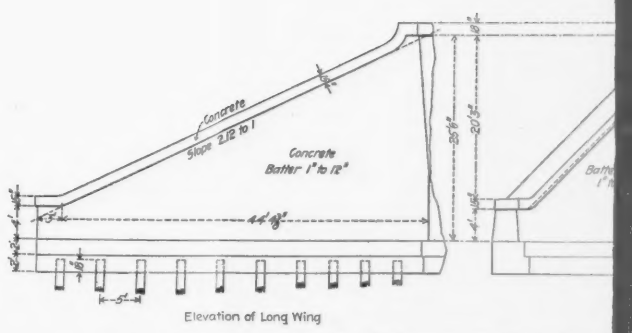
Glen Creek Bridge, Watkins Glen.



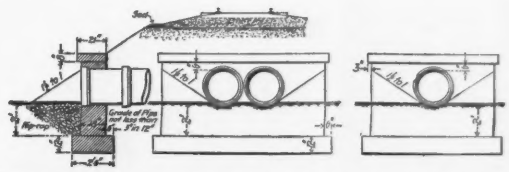
Normal Tunnel Cross-Section, Masonry Lined. Without Timbering.



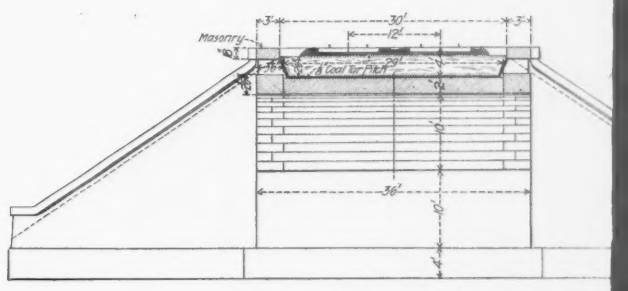
Standard 15 ft. x 15 ft. Concrete Arch Culvert.



Details of Masonry; 25 ft. Arch Cul

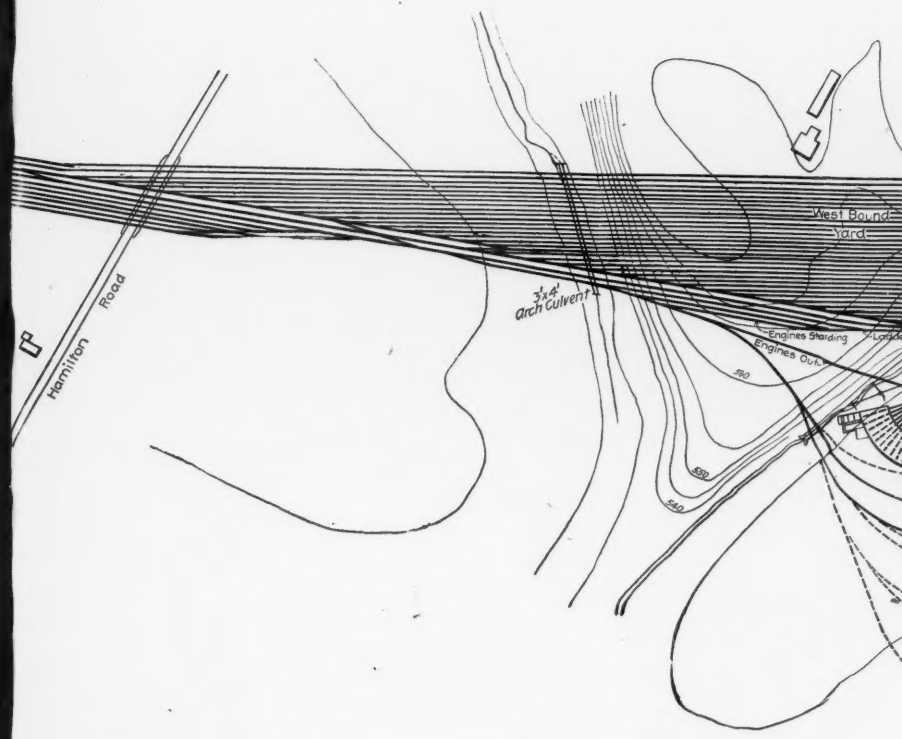


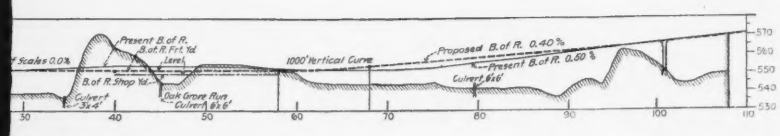
Standard End Walls for Pipe Culverts, Straight Type.



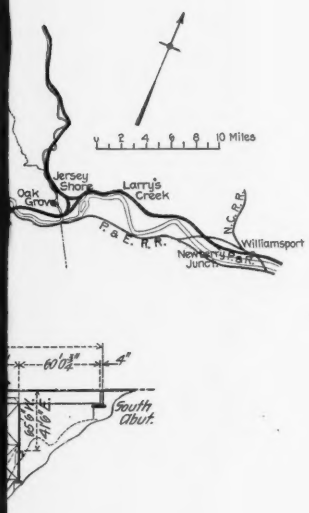
Details of Arch to Replace Bridge, Nea

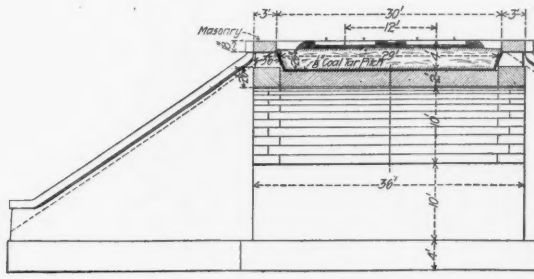
BEECH CREEK EXTENSION, PENNSYLVANIA DIVISION, NEW YORK CENTRAL & HUDS





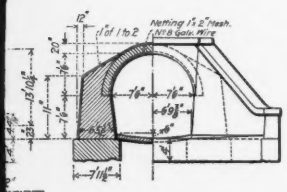
Oak Grove Yard.



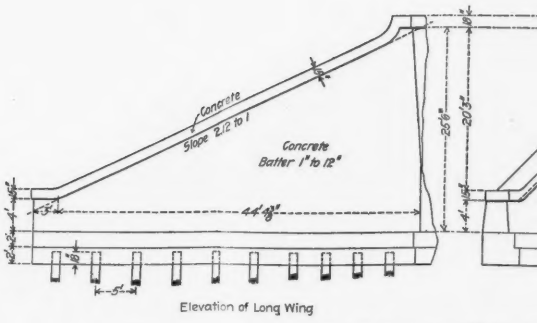


Details of Arch to Replace Brid

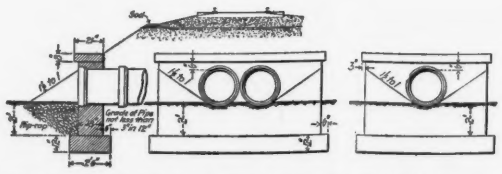
Profile (dotted)
rofile (full)



Standard 15 ft. x 15 ft. Concrete Arch Culvert.

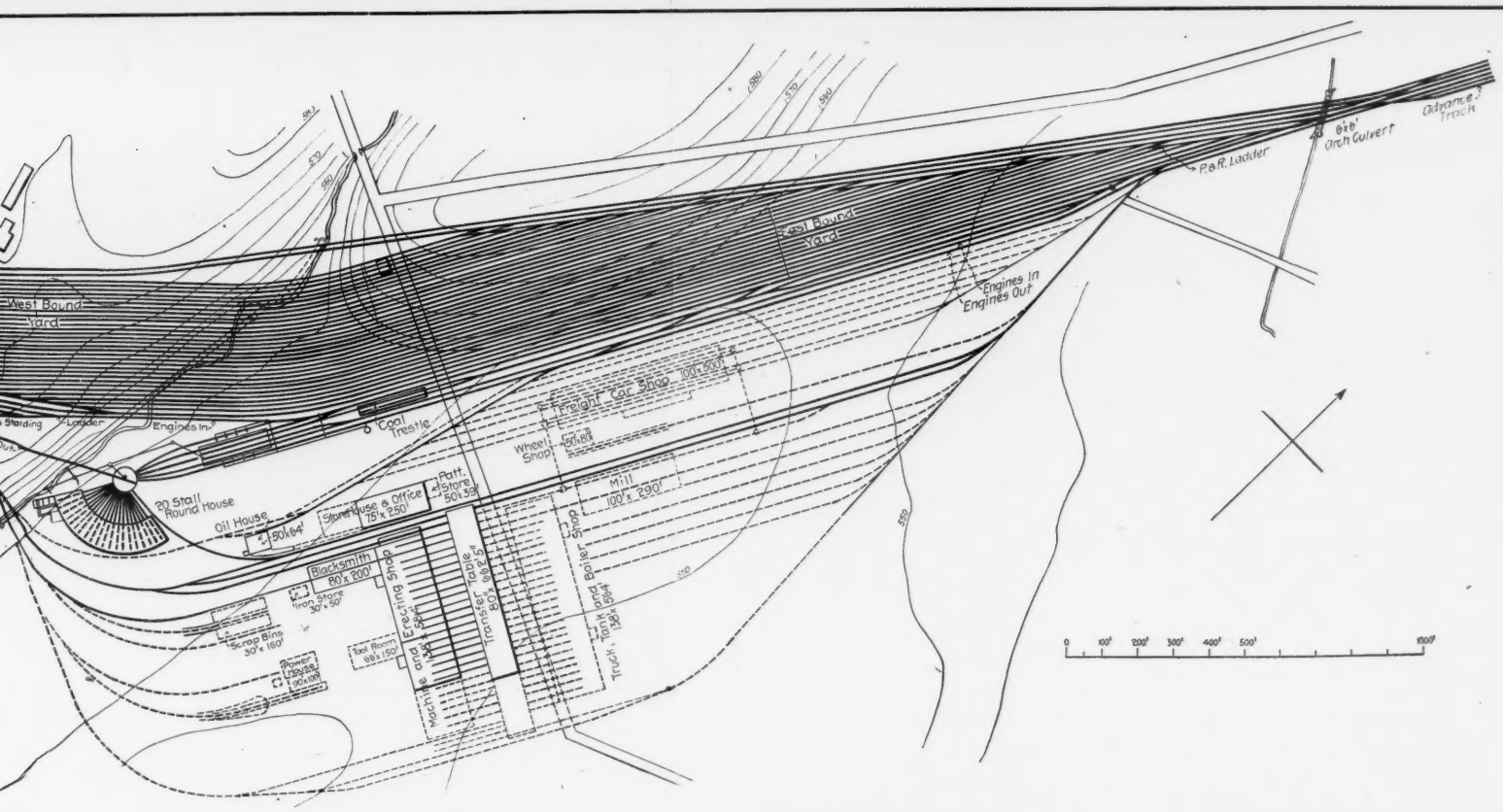


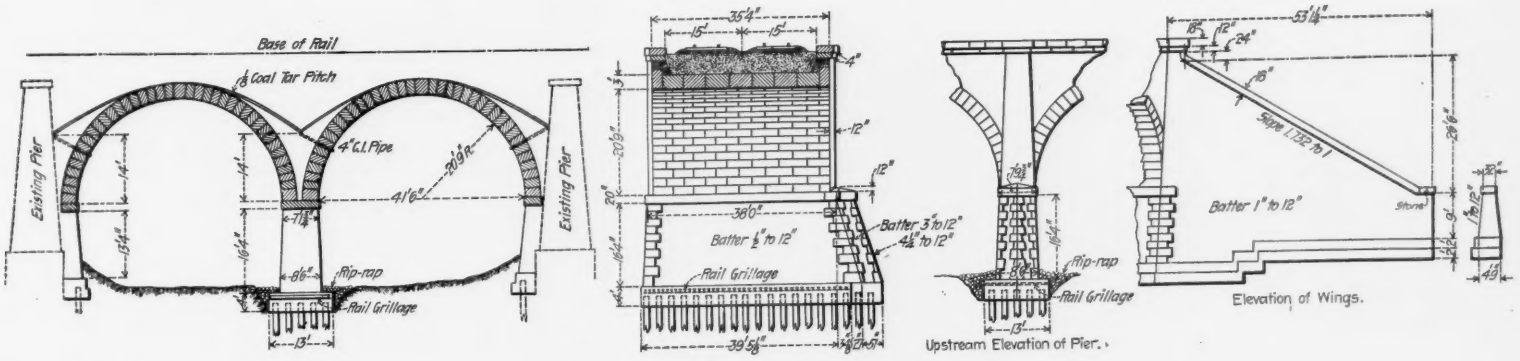
Details of Masonry; 25 ft. A



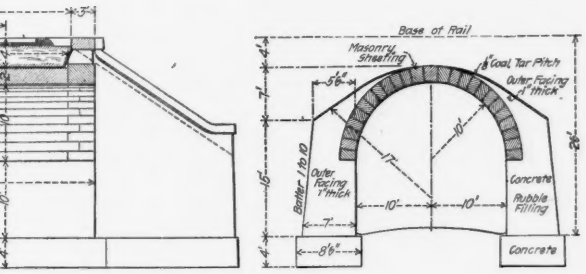
Standard End Walls for Pipe Culverts, Straight Type.

BEECH CREEK EXTENSION, PENNSYLVANIA DIVISION, NEW YORK CENTRAL &

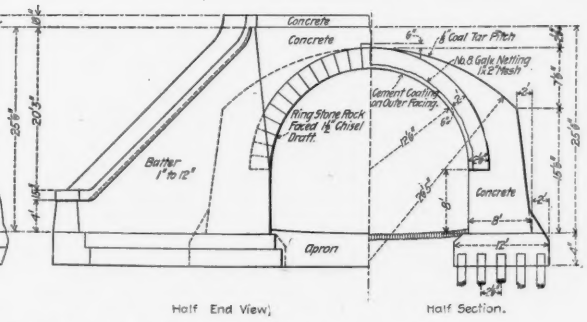




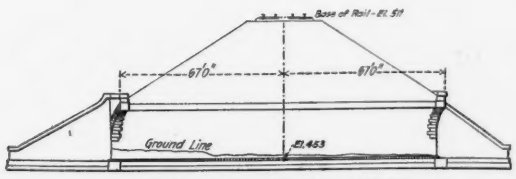
Details of Arch to Replace Bridge, Larry's Creek.



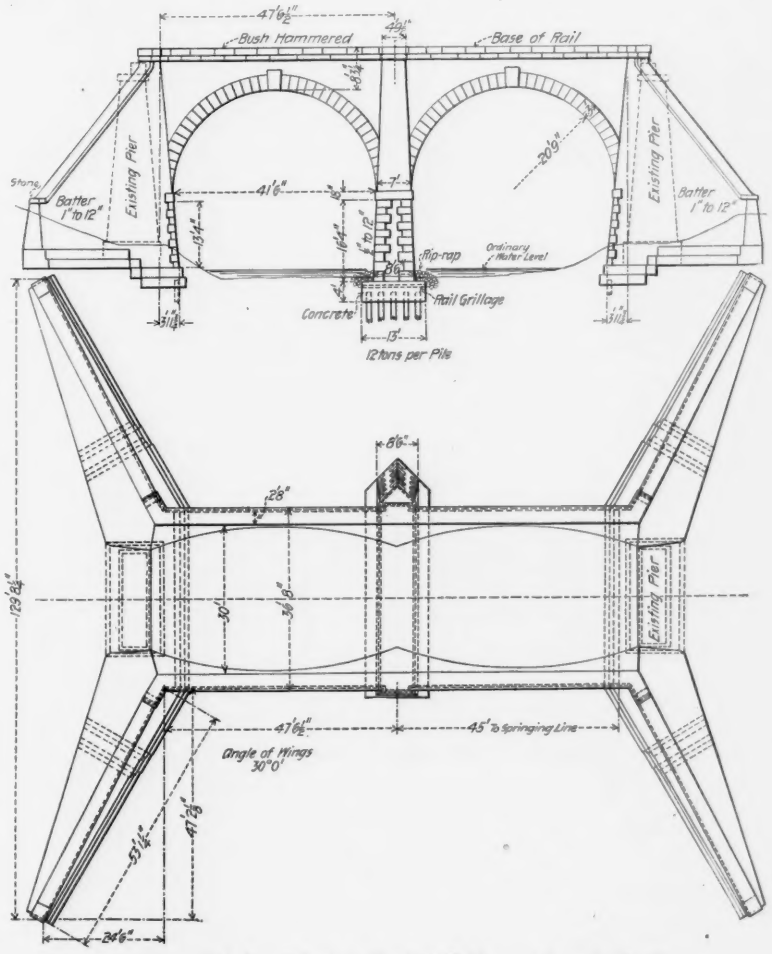
Replace Bridge, Near Larry's Creek.



ry; 25 ft. Arch Culvert at Dresden.



Section on Center Line of Culvert.



Details of Arch to Replace Bridge, at Larry's Creek.

ENTRAL & HUDSON RIVER RAILROAD, INCLUDING THE YARD AT OAK GROVE.

in which d is the horizontal distance traversed in feet; v, the velocity of wind in feet per second; h, the height through which the body is allowed to fall in response to gravity; and g, the acceleration due to gravity, or 32.2.

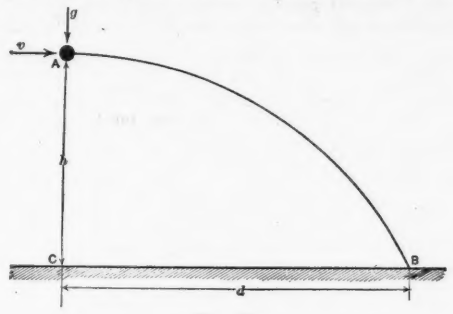


Fig. 60.

By use of this formula the values for d shown by Table IX have been obtained. The table shows how far it is possible for a body to be borne by the wind starting from points at various distances from the ground and influenced by wind of different velocities.

Table IX.—The Horizontal Displacement of a Body by Wind of Different Velocities, While Falling from Different Heights.

Velocity of wind.		Initial height in feet from which the body is assumed to start.							
Feet per second.	Miles per hour.	15	20	25	30	40	50	75	100
2.93	2	2.8	3.3	3.6	4.0	4.6	5.2	6.3	7.3
7.34	5	7.0	8.1	9.1	10.0	11.5	13.0	15.8	18.3
11.74	8	11.3	13.0	14.5	16.0	18.4	20.8	25.3	29.2
17.60	12	16.9	19.5	21.8	23.9	27.6	31.2	38.0	43.8
23.47	16	22.5	26.0	29.1	31.9	36.8	41.5	50.5	58.4
29.34	20	28.2	32.6	36.4	39.9	46.1	51.9	63.3	73.0
44.01	30	42.2	48.8	54.6	59.8	69.1	77.9	94.9	109.6
58.68	40	56.3	65.1	72.7	79.8	92.1	103.8	126.6	146.1
73.35	50	70.4	81.4	90.9	99.7	115.1	129.8	158.2	182.6
88.02	60	84.5	97.7	109.1	119.7	138.2	155.8	189.9	219.1

For example, when the initial height h of the body above the ground is 20 ft., and the wind velocity is 12 miles per hour, the horizontal distance d is 19.5 ft. Again, when the initial height is 50 ft., and the wind velocity is 40 miles per hour, the distance is 103.8 ft. It is to be noted that the equation and the table derived by its use, presuppose that the body in question is free from the action of all forces except that of gravity and that of the horizontal movement of the wind. Under this assumption the values given are absolute. As a matter of fact, a body in falling in air is retarded somewhat by the resistance of the atmosphere, and would therefore be a trifle longer in its descent than is allowed by the formula, with the result that the horizontal distance would also be greater. In another paragraph an attempt will be made to give a correction for this influence. For the present the results as given should be accepted as defining the physical relationship applicable to a freely falling body.

We have next to consider the path and horizontal displacement of a body *projected vertically upward* when free to respond to the influence of gravity and of wind acting horizontally. Fig. 61 is a graphical representation of the path followed by a body which when starting from a definite point, as A, is projected vertically upward while subject to the action of the wind, which tends to move it horizontally. The arrow g shows the direction of the force of gravity. The arrow v shows the direction of the constant wind velocity. The curved line A B C D shows the path which the body will follow in its journey to the ground. The maximum height, h_2, is not reached until some distance, l_1, from the initial position. From this point the body gradually falls to the ground through a horizontal distance l_2. The total horizontal distance† traversed by the body is expressed by

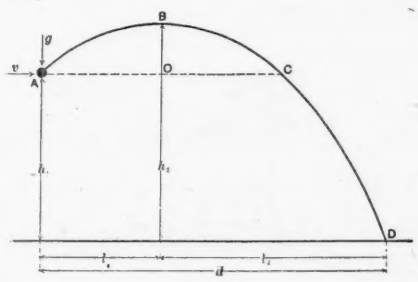


Fig. 61.

$$d = v\left\{\sqrt{\frac{2h_2}{g}} + \sqrt{\frac{2(h_2 - h_1)}{g}}\right\} \quad \ldots\ldots\ldots\ldots (b)$$

Table X gives values for d as obtained from formula (b) by the substitution of successive values of h_2 and v. The initial height h_1 is taken at 15 ft.† For example, when the maximum height to which the body rises is 20 ft., and the wind velocity is 12 miles per hour, the horizontal distance d through which the body will travel in falling to the ground is found to be 29.4 ft. If the maximum height be increased to 50 ft. and the wind velocity to 40 miles per hour, the horizontal distance d is found to be 191.4; if the wind velocity be 60 miles, the displacement becomes 247.8 ft.

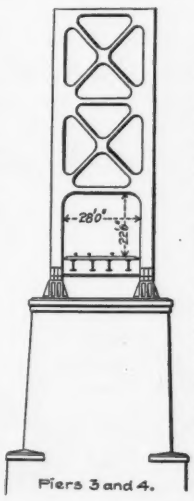
†An initial height of 15 ft. represents approximately the distance of the top of a locomotive stack above the ground.

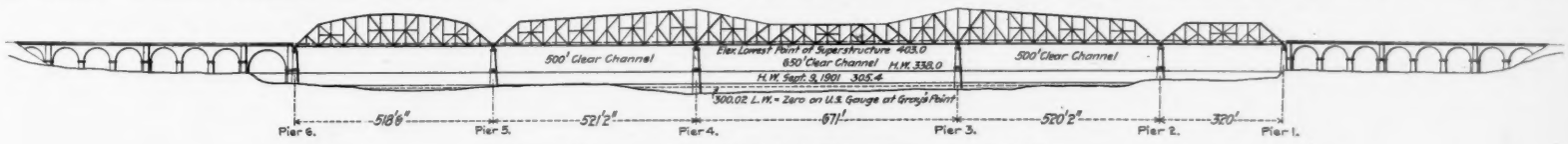
Table X.—Horizontal Displacement of a Body Projected Vertically Upward from an Initial Height of Fifteen Feet and Free to Move Both in Response to Gravity and to the Influence of Wind Acting in a Horizontal Direction.

Velocity of wind.		Maximum height in feet to which body is projected.							
Feet per second.	Miles per hour.	15	20	25	30	40	50	75	100
2.93	2	2.8	4.9	5.9	6.8	8.3	9.6	12.0	14.1
7.34	5	7.0	12.2	14.8	17.0	20.7	23.9	30.0	35.2
11.74	8	11.3	19.6	23.7	27.3	33.0	38.3	48.0	56.2
17.60	12	16.9	29.4	35.6	40.9	49.6	57.4	71.9	84.4
23.47	16	22.5	39.2	47.5	54.6	66.1	76.5	95.1	112.5
29.34	20	28.2	50.0	59.4	68.2	82.6	95.7	119.9	140.6
44.01	30	42.2	73.5	89.1	102.3	123.9	143.5	179.9	210.9
58.68	40	56.3	98.0	118.7	136.4	165.2	191.3	239.8	281.2
73.35	50	70.4	122.5	148.4	170.5	206.5	239.1	299.8	351.5
88.02	60	84.5	147.0	178.1	204.6	247.8	286.9	359.7	421.9

The New Bridge Over the Mississippi at Gray's Point.

The accompanying engraving shows the preliminary plan for the large cantilever bridge to be built over the Mississippi River from Gray's Point, Mo., to Thebes, Ill., for the Southern Missouri & Illinois Bridge Co. Messrs. Alfred Noble and Ralph Modjeski, of Chicago, are the Engineers. As previously stated the bridge will be a double-track structure about 65 ft. high. The general dimensions were given Feb. 28, p. 149, but some slight changes have been made since. Beginning at the east end there will be first about 600 ft. of concrete arches having 45 or 50 ft. openings; then in order a 320-ft. span; one span each of 520 ft. 2 in., 671 ft., 521 ft. 2 in., 518 ft. 6 in.; then a concrete arch with a clear opening of 100 ft., followed by about 600 ft. of concrete arches with 45 or 50-ft. openings. Work has already been begun and contracts for the substructure and superstructure will be let soon.





New Bridge Over the Mississippi River at Grays Point, Mo.

MESSRS. ALFRED NOBLE *and* RALPH MODJESKI, *Engineers.*

Pensions on the Metropolitan Street Railway.

The Metropolitan Street Railway Company, operating all of the surface street railroads in Manhattan Borough, New York City, and controlling also the lines to Yonkers, New Rochelle and other points north of New York, has decided to retire all employees at the age of 70; and to pay pensions, in accordance with a circular which has just been issued by President H. H. Vreeland. This circular, slightly condensed, reads as follows:

The plan I have long had in mind of establishing a pension system for the relief of the superannuated employees of this company, members of the Metropolitan Street Railway Association, whose annual maximum wages have not exceeded $1,200 per annum, has finally been perfected, and will be put into effect on or before July 1.

This pension system provides for voluntary and involuntary retirement of two classes: (1) all who have attained the age of 70 years, who have been continuously in service 25 years; (2) all from 65 to 69 years, who have been 25 years in service, who, in the opinion of the trustees of the pension, have become physically disqualified.

All employees of 70 years will be considered to have attained a maximum age allowed for active service, and will be retired by age limit. The [annual] pension allowance will be upon the following basis:

(a) If service has been continuous for 35 years or more, 40 per cent. of the average annual wages for the 10 previous years.

(b) If service has been continuous for 30 years, 30 per cent. of the average annual wages for the 10 previous years.

(c) If service has been continuous for 25 years, 25 per cent. of the average annual wages for the 10 previous years.

The fund from which payments will be made will be appropriated each year by the company, and employees will not be required to contribute to it.

My object in establishing this department is to preserve the future welfare of aged and infirm employees, and to recognize efficient and loyal service.

To a reporter President Vreeland said: "This plan has been in contemplation for a long time; in fact, I had it in mind when I took charge of the twenty-odd street railways making up the present Metropolitan system.

"It was apparent that among men brought together by the recruiting methods then in existence, social intercourse for mutual benefit and improvement was practically impossible. Men were employed in a majority of instances through political influences, with the natural result that discharges among 4,000 men amounted to about 300 a month. Within a year the results of this reform began to manifest themselves in all directions, and, while the number of men was rapidly increased, the number of discharges steadily decreased until they were diminished to as many in a month as had previously occurred in a single day.

"There was developed a system of discipline at once rigid and equal. No man was to be deprived of his employment without a hearing, and for reasons which were explained to him. My men grew in dignity, responsibility and efficiency, and the time was ripe for furnishing some means of social amusement and benefit. Then came into existence, through the action of the men themselves, the Metropolitan Street Railway Association, which is justly regarded as the unique organization of its kind in existence. It is unpatronized by the corporation, it pays its own bills, nurses its own sick and buries its own dead, on a system devised by a board of trustees of its own election, and is, in fact, the cheapest and promptest known insurance. During the brief term of its existence it has collected, distributed and invested over $100,000. Its main objects are to secure to its members free medical attendance, one-half of the wages in case of illness and $300 in case of death. These purely material benefits, to say nothing of the monthly entertainments, theatrical, athletic, musical and instructive, are secured to members at an expense of 50 cents a month. It has a library of over 1,500 books, and there are pool tables and other means of recreation, representing an outlay of about $8,000. Freedom and opportunity will inevitably bear more fruit than sympathetic patronage.

"This reform in the recruiting methods of the Metropolitan company, steadying, as it did, the employment in a single community of over 15,000 able-bodied wage earners, was an immense civic service to which very little attention has been paid by the press and public.

"All the non-laborious and desirable positions in the various barns and stables, switch tending, transfer agencies and the like, are given, as a matter of rank, to those longest in the service, so that between the time of a man's highest efficiency (during which the association takes care of accidents to life and health) and the age of retirement, the company looks out for him by adjusting him in the system to work he can comfortably and efficiently perform."

The Government's Suit Against the Northern Securities Co.

The expected action of the Attorney-General of the United States against the Northern Securities Company was taken in the United States Circuit Court at St. Paul on March 10. A bill in equity was filed by District Attorney Milton D. Purdy, asking for an injunction to prevent the carrying out of the plan, for virtually consolidating the Great Northern and the Northern Pacific railroads, which is embraced in the establishment of the N. S. Co. The allegations of the bill are set forth in 13 sections and the prayer, at the end, fills nearly a column. The main allegation is contained in section No. 4, as follows:

"By making the stockholders of each system jointly interested in both systems and by practically pooling the earnings of both systems for the benefit of the former stockholders of each, and by vesting the selection of the directors and officers of each system in a common body to-wit, the holding corporation, with not only the power, but the duty, to pursue a policy which would promote the interests not of one system at the expense of the other, but of both at the expense of the public, all inducement for competition between the two systems was to be removed, a virtual consolidation effected and a monopoly of the interstate and foreign commerce, formerly carried on by the two systems as independent competitors established."

It is declared that if the Northern Securities Company does not hold a large majority of the capital stock of the Great Northern, it is because the men in control have, since they heard that the Government would attack them, caused the stock to be withheld. It is declared that the Northern Securities Company was organized solely to incorporate the pooling of the stocks of the companies named, and thus carry into effect the unlawful combination charged. If the Government fails to pre-

vent the carrying out of this combination or conspiracy, the anti-trust law may be circumvented and set at naught; and all the railroads of the country may be thus consolidated.

Construction and Maintenance—New York Central.

The Chief Engineer of the New York Central & Hudson River has sent us a memorandum of expected items for attention during the season of 1902. The programme includes:

Gravel ballast	400,000 cu. yds.
Cinder ballast	150,000 cu. yds.
Broken stone ballast	265,000 cu. yds.
Total	815,000 cu. yds.

Thirty thousand tons of new rail as follows:

100-lb. rail	3,700 tons
70-lb. rail	4,000 tons
80-lb. rail	22,300 tons

In addition to the new rail old 80-lb. rail will be extensively used for renewals of lighter sections on the Pennsylvania Division. There will be used in renewals:

Yellow pine ties	1,240,000
Local oak and chestnut ties	225,000
Cedar and cypress ties	80,000
Total	1,545,000

Of these 1,140,000 will be used in the main tracks; balance in side tracks and in new construction.

For replacing small openings in the track 700 tons of cast-iron pipe will be used, and many of the smaller openings will be replaced with solid rail floor culverts.

Contracts have been awarded for bridges aggregating 65,000 tons. A large portion of this work has already been completed.

A number of stone and brick stations will be built at different points on the system during the year; also several new freight stations. Mechanical coaling plants and coaling trestles are to be constructed at several points. New modern coal stocking plant is under contract for West Albany and smaller plants are contemplated at other points. A new eight-stall engine house is to be built at Brewsters, on the Harlem Division; 30-stall modern engine-house at Dewitt, on the main line; eight-stall engine-house at Clearfield, on the Pennsylvania Division, and several additional large modern engine-houses are contemplated at other points. A large modern shop plant and a new engine-house is under construction at Oak Grove on the Pennsylvania Division, and extensive additions are under way and projected at the existing West Albany and Depew shops.

Extensive improvements are contemplated in renewing and adding to water stations.

The alignment is under process of improvement at various points. Extensive grade revisions are contemplated on the Pennsylvania Division, and sea-wall riprapping is actively progressing on the Hudson and Mohawk Divisions.

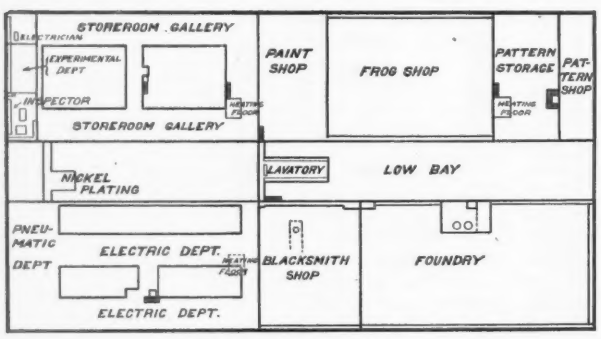
Extensive and radical improvements are under way at the deep-water terminal of the West Shore Railroad at Weehawken. And important improvements have been approved in the neighborhood of the Grand Central Station, and new freight terminals are contemplated at several minor points between New York and Albany, including new team yards and freight houses.

A new team yard with a large intercepting sewer is under construction at Albany. Extensive grade elimination scheme is contemplated at Schenectady. Arrangements have already been made for a change in the yard, elimination of grade crossings, and new passenger station at Utica. New station is about to be let by contract at Troy. New improvements, including elimination of grade crossing, new freight and passenger station are about to be started at Cohoes, and important elimination improvements are contemplated at other points on this Division.

On the Western Division a new connection between the Auburn line and the main line is to be built, eliminating 15 grade crossings at Syracuse. The work of completing the elimination of grade crossings in the City of Buffalo is under way, and it is expected that nine crossings will be completed this season. Other important elimination schemes are under advisement on this division.

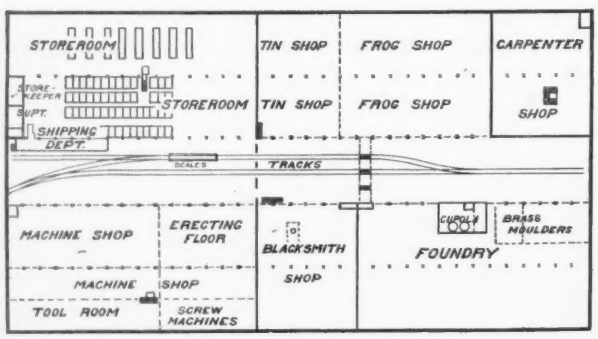
The New Shops of the Union Switch & Signal Company.

The large new shops of the Union Switch & Signal Company at Swissvale, Pa., which were partly described in our issue of Nov. 15 last, p. 784, constitute what is probably the largest establishment in the world for making signals and signal machinery. There are four main buildings, joined together, with a total length of about 600 ft., and a total width of about 225 ft. (not counting the low bay), and there is a power house south of the main shop which is 90 ft. x 50 ft.



GALLERY PLAN

Fig. 2.



MAIN FLOOR PLAN

Fig. 3.

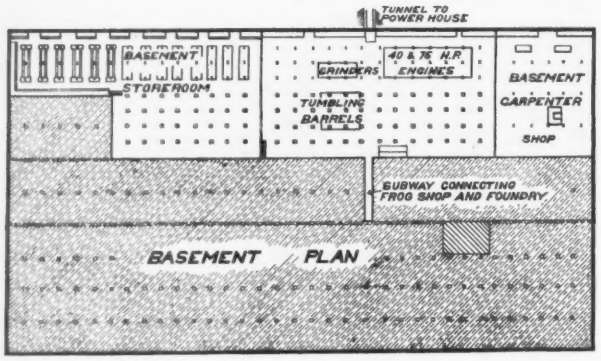


Fig. 4.

Floor Space.	Sq. ft.
Store room basement	23,160
Frog shop basement	26,880
Carpenter shop basement	11,520
Total basement	61,560
Machine shop, first floor	28,800
Store room, first floor	28,800
Frog shop, first floor	26,880
Carpenter shop, first floor	11,520
Foundry	26,880
Blacksmith shop	11,520
Total, first floor	134,400
Machine shop, second floor	18,240
Store room, second floor	19,200
Frog shop, second floor	7,680
Carpenter shop, second floor	11,520
Total, second floor	56,640
Basement	61,560
First floor	134,400
Second floor	56,640
Power house	4,320
Office building	18,000
Low bay	33,600
Total	*308,520

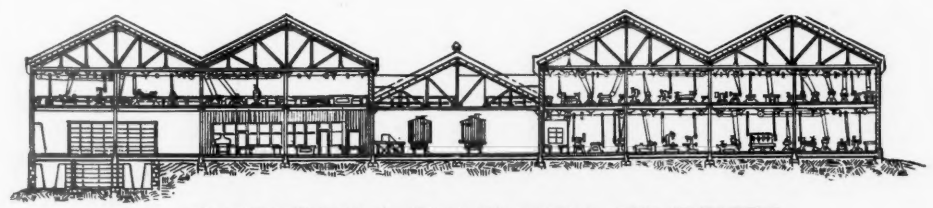


Fig. 5. SECTION THROUGH EXPERIMENTAL AND ELECTRIC DEPTS. SHIPPING FLOOR, STOREROOM AND MACHINE SHOP.

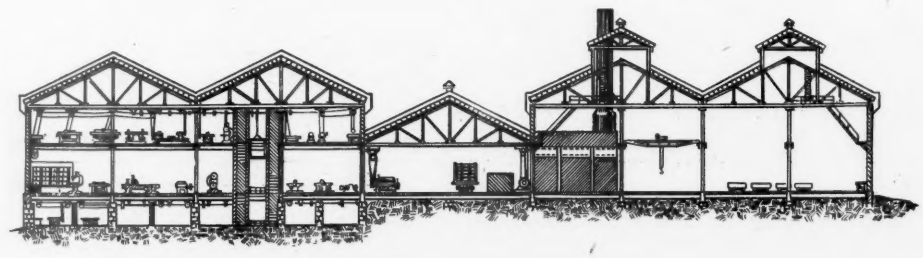


Fig. 6. SECTION THROUGH PATTERN SHOP CARPENTER SHOP AND FOUNDRY.

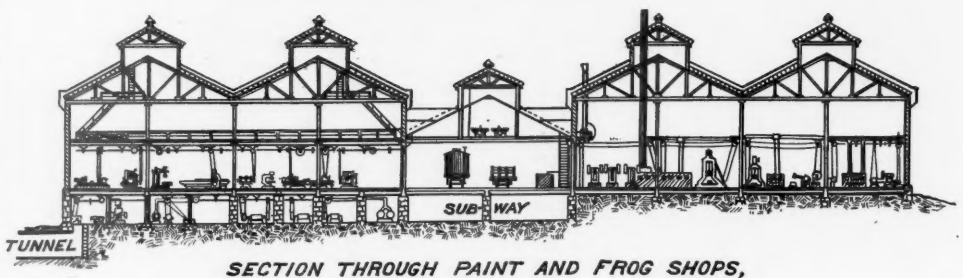


Fig. 7. SECTION THROUGH PAINT AND FROG SHOPS, LOW BAY, BLACKSMITH SHOP AND ENGINE-ROOM IN BASEMENT.

NEW SHOPS OF THE UNION SWITCH & SIGNAL COMPANY, SWISSVALE, PENNSYLVANIA.

East of the shops is the yard containing the track approaches, and at the easterly side of this yard is the office, a three-story and basement brick building 85 ft. x 60 ft. This building was described in the article just referred to.

The visitor to the shops enters first the store room, which is 225 ft. x 120 ft. There is a second store room of similar size, beneath this, in the basement, and the store room on the main floor, which is very high, has a wide gallery on all sides, which makes an upper floor, nearly as large as that on the ground, the opening to the roof in the center of the building being only about 60 ft. wide. Adjoining the store room is the switch and frog department, which is 210 ft. x 120 ft. In this room there are eight large planers, 15 punches, two bulldozers, one steam riveter, one shear punch, two shapers and one cold saw.

The blacksmith shop is 90 ft. x 120 ft. In this room there are three large drop forges besides many smaller forges. Natural gas fuel is used in all but a very few of the forges and the room is practically free from smoke.

The machine shop is 225 ft. x 120 ft. with two wide galleries. In this shop are made all of the mechanical and electrical machinery used in the varied signaling devices which this company produces, including the new high-speed electric staff instrument. Apparently the company buys nothing but raw material, all the electromagnets and dynamos, as well as simpler parts being made on the premises. There are on one side of this shop 35 automatic machines for making small brass screws, bolts of iron and brass and other small things.

The shops are supplied with fresh air through large pipes leading from Sturtevant blowers.

The foundry is 225 ft. x 120 ft. The dimensions of the other rooms may be learned from the diagram; and the floor space of the whole of the shops, main floor, second floor and basement is as follows:

Total area of property, 10.51 acres.

*A little over seven acres.

Distribution of Power.

Foundry:		
One 30	h.p. motor (Type C)	Cupola blower.
One 15	h.p. motor (Type F)	Cupola elevator.
Pattern Shop:		
One 5	h.p. motor (Type C)	Line shafting, wood tools.
One 10	h.p. motor (Type F)	Elevator.
One 20	h.p. motor (Type C)	Sturtevant heater and ventilator.
Carpenter Shop:		
One 30	h.p. motor (Type C)	For large wood surfacing machine.
One 30	h.p. motor (Type C)	Line shafting, saws, mortisers, rabbeters, etc.
One 20	h.p. motor (Type C)	Line shafting, saws, mortisers, rabbeters, etc.
Blacksmith Shop:		
One 20	h.p. motor (Type C)	Exhaust fan for hand forges.

One 30 h.p. motor (Type C) Friction drop hammer.
One 15 h.p. motor (Type C) Bolt machine, bulldozers, welders, etc.
One 7½ h.p. motor (Type C) Blast fan for forges and heating furnaces.
One 5 h.p. motor (Type C) Combination shear punch.

Machine Shop, first floor:
One 30 h.p. motor (Type C) Line shafting, general machines.
One 30 h.p. motor (Type C) Line shafting, general machines.
One 15 h.p. motor (Type C) Line shafting, tool room.
One 20 h.p. motor (Type C) Line shafting automatic and hand screw machines.

Machine Shops, galleries:
One 30 h.p. motor (Type C) Sturtevant heater and ventilator.
One 10 h.p. motor (Type F) Elevator.
One 20 h.p. motor (Type C) Line shafting, brass and bench lathes.
One 15 h.p. motor (Type C) Line shafting, general machines.
One 7½ h.p. motor (Type C) Line shafting, general machines.

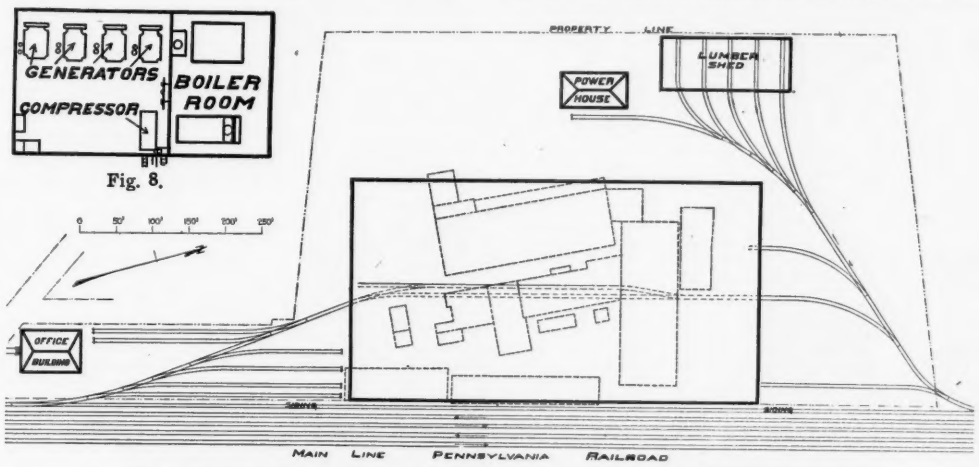


Fig. 8.

Fig. 1.—Outline Plan of Union Switch & Signal Company's Shops, Swissvale, Pa.

The dotted lines show the outlines of the old shops.

One 7½ h.p. motor (Type C) Line shafting, general machines.

Store room:
One 30 h.p. motor (Type C) Sturtevant heater and ventilator.
One 10 h.p. motor (Type F) Elevator.
One 5 h.p. motor (Type C) Line shafting, erecting tool repairs.

Casting Cleaning:
One 10 h.p. motor (Type C) Tumbling barrels and emery wheels.

Tin Shop:
One 5 h.p. motor (Type C) Shears, benders, flangers, etc.

Pipe cutting and threading and plugging:
One 5 h.p. motor (Type C) Pipe cutters and threaders, drill presses.

Test Department:
One 5 h.p. motor (Type C) Line shafting, testing and experimental tools.
One 1 h.p. rotary transformer For nickel and other plating.

All of the motors are of the Westinghouse 2-phase induction type. Besides the above motors, there are used for the operation of frog and switch planers, drills, shapers, etc., two Westinghouse standard steam engines, one of 40 and one of 75 h.p, the rapid growth of the business compelling the use of these temporarily, owing to like activity in the manufacture of electric power apparatus and to the consequent delay in securing suitable motors to take their place.

Eventually these engines will be discarded, however, and to the 31 motors now in use, which aggregate 493.5 h.p., will then be added four 30 h.p. motors, making a total of slightly over 600 h.p. used for other than lighting purposes.

These motors, the 1,200 incandescent and the 50 arc lights employed about the property, all of which have been increased in number considerably as the rapid growth of business demanded, call for an energy greater than the present equipment of the power house can produce, necessitating the temporary rental of power from the Monongahela Traction Company.

In the power house at present are two Babcock & Wilcox boilers of 60 h.p. each, and two tubular boilers of 75 h.p. each, which supply the steam hammers of the blacksmith shop, and the riveters and engines of the frog shop, and the radiating coils of the Sturtevant heaters throughout the works.

A 16-in. x 18-in. class J Ingersoll-Sergeant air compressor situated in the power house is also driven by energy derived from these boilers. This compressor maintains a pressure of 100 lbs. in a pipe line throughout the shops, which is used for testing purposes and for cleaning those machines which are inaccessible to other methods of cleaning.

Three Westinghouse 125-h.p. gas engines (run by natural gas from wells nearby) each direct-connected to a 75-k.w. two-phase alternating Westinghouse generator, producing 7,200 alternations per minute, form the chief source of energy from which the shop motors derive their power, and for the general illumination of the entire plant. Preparations are under way for three more of these combined machines, all of which will be at times required to furnish the power and light demanded—a total of 750 h.p.

These, with the steam generating equipment, will make a grand total of 1,020 h.p. developed for all purposes.

The following statistics give a fair idea of the magnitude of this busy plant and of its daily output:

Foundry (iron work), 35 moulders, 17 core makers, 33 laborers; (brass work), 7 moulders, 1 core maker, 1 laborer.
Blacksmith shop, 25 men on hand forgings; 40 men on hammers, shears, punches, bolt and forging machines, including laborers.
Frog shop, 24 men on planers and other machines; 11 laborers.
Machine shop, 22 men in tool room; 149 men in interlocking department (mechanical); 40 men in interlocking department (pneumatic); 50 men on automatic block signals; 100 men on instruments; 22 men on general work.

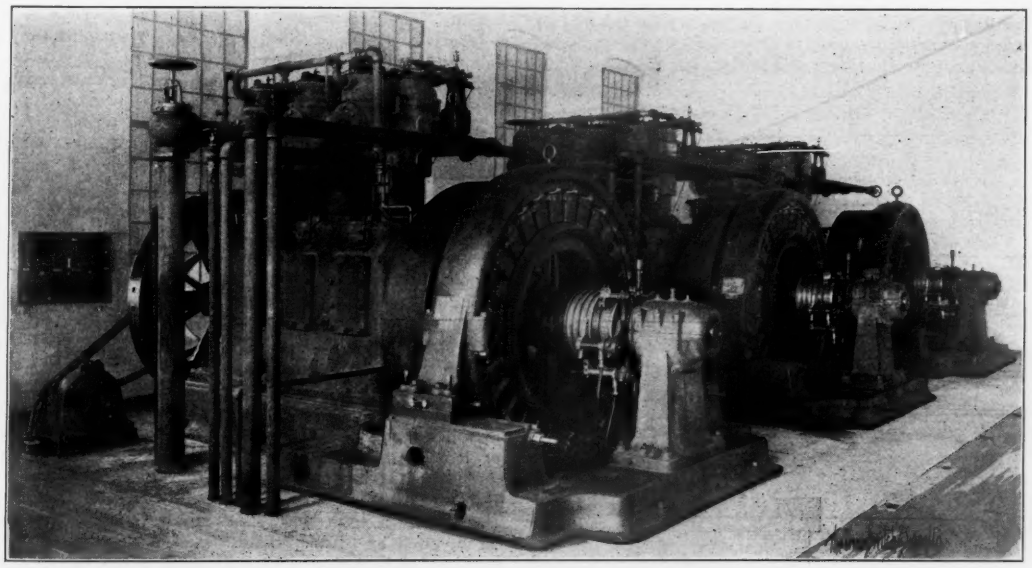


Fig. 9.—Interior of Power House, Swissvale.

Pattern shop, 9 pattern makers on wood; 4 pattern makers on metal.
Carpenter shop, 4 carpenters on wood-working machinery; 9 carpenters on bench work; 9 laborers.
Tin shop, 4 men on punches, shears and other machines; 7 men on bench work.
Paint shop, 8 men.
Repair department, 15 men.
Store room, 41 men.
Shipping department, 14 men.
Experimental department, 4 men.
Inspectors and tests, 8 men.
Power house force, 5 men.
Shop motors and light force, 6 men.
Yard gangs, 52 men.
Superintendents and heads of departments, 20 men.
Total shop force, 795.
Office force, including executive officers, assistants, draughtsmen and clerks, 48 men.
Agents and assistants, 9 men.
Foremen in charge of erecting, including present force engaged on outside work, 288 men.
Grand total of employes of the company, 1,140 men.
Average consumption of pig iron daily, lbs., 22,738.
Average number of iron castings made daily, 2,465.
Average consumption of brass daily, lbs., 543.
Average number of brass pieces cast daily, 702.
Average shipment of finished product for six months past, daily, 34 tons.

A proposal to tax railroad tickets (as has been done in France almost from the beginning) is before the Austrian Parliament, and is sure to be adopted in some form. The committee in charge has the impudence to assert that the tax should be imposed on free passes also.

Viaduct at Fort Dodge, Iowa.

There is now building at Fort Dodge, Iowa, on the Mason City & Fort Dodge, a long single track viaduct across the valley of the Des Moines River, the conditions being very similar to those at Boone, Iowa, where the Chicago & North Western recently built a big viaduct. The Mason City & Fort Dodge is a part of the Chicago Great Western's new extension to Omaha. Mr. H. C. Keith is Bridge Engineer and Mr. J. Marsden, Jr., is Chief Engineer of this work.

The viaduct is to be 2,585 ft. long and 135 ft. from ordinary low water level to the base of rail, crossing the Des Moines River, the Minneapolis & St. Louis main track and yards, and the main track of the Illinois Central. The substructure which is building by the Bates & Rogers Construction Co., will be finished by the first of May; all this work on the south side of the river is now finished. The American Bridge Co. will furnish the superstructure.

The bridge consists of 18 towers. Four towers support spans of 220 ft. each and 14 towers support girder spans of about 75 ft. each. The steel towers supporting the 75-ft. spans in most cases rest on pedestals, and those supporting the 220-ft. spans, in all but one instance, rest on stone piers.

The stone pedestals have concrete footings, Kettle River sand stone cap-stones and two courses of cut stone under the cap-stones. Between the footings and the bottom course of cut stone is concrete faced above the frost line with sand stone paving blocks. The piers are heavy rubble sand stone masonry, excepting the three upper courses, which are cut stone.

In building the substructure on the north side of the river, a spur track was extended from a siding of the Minneapolis & St. Louis alongside the work so that cars were unloaded by derricks directly opposite each tower, making a very convenient scheme for handling material. To serve the south side, a light push car track was built alongside the work crossing the river on a light temporary bridge. Materials were then unloaded from the large cars north of the river and placed on small push cars. These were run down across the bridge by gravity and hauled up the south slope by a cable and hoisting engine. Crushed stone was received in Rodger ballast cars and dumped from a trestle and then loaded into push cars. Derricks at each pier were used in excavating and for unloading materials from the push cars.

All the concrete used on the south side of the river was mixed at a central mixing plant at the foot of the south slope and placed in buckets. These were then hauled to the work on the small cars and handled by derricks. The cars were returned by gravity to the mixing plant. Two Ransome and one Smith concrete mixers were used on the work and the concrete was all handled from the mixers by derricks.

The Isthmian Canal.

The following is the New York *Sun's* report of some interesting testimony lately given in the canal matter:

From the testimony given before the Senate Interoceanic Canal Committee, March 8, by Thomas B. Atkins, Secretary and Treasurer of the Maritime Canal Company, it was evident that the company not only expected the Government, if it constructs the canal by the Nicaragua route, to reimburse it for the amount already expended on the canal, but also to make some provision for taking care of the stock issued by the company.

Mr. Atkins said the company, notwithstanding the action taken by Nicaragua and Costa Rica, still considered it possessed the exclusive franchise for building a canal by the Greytown-Brito route. He gave a resume of the negotiations with Nicaragua and Costa Rica regarding the franchise. The former State was to have $6,000,000 and the latter $1,500,000 of Maritime Canal Company's stock for extending the franchise. Nicaragua subsequently demanded bonds or cash, and then, when the limit expired, had declared the franchise forfeited. Costa Rica had accepted the stock, he said, and still held it. The first clash between the company and Nicaragua had come over the concessions along the route, that State claiming the rights of the San Juan River forming the boundary with Costa Rica. The company having acquired those of the latter State, Mr. Atkins said the Maritime Company owned 50,000 acres of land in Nicaragua along the route of the canal.

Replying to questions Mr. Atkins said the company had issued 222,135 shares of stock, of which 31,990 shares had gone to the construction company. The company had expended about $4,000,000 in the actual work of construction. He thought the company expected the Government to reimburse it for the amount actually expended. He recognized that the company could not build the canal without the co-operation of the United States Government. If the Government built the canal he hoped some arrangement would be made for taking care of the interests of the Maritime Company, but if the Government went ahead with the building of the canal without regard to the claims of the company, it would step aside, notwithstanding the great injustice that would result.

Railroads in Southern Brazil.

The following, taken from the consular report, is a translation from the *Frankfurter Zeitung* relative to the projected extension of the railroad system of Southern Brazil:

Complaint has frequently reached us from German-Brazilian circles concerning the withholding of German capital from profitable enterprises in Southern Brazil, in spite of the fact that the North Americans are making great exertions to obtain a firm footing in the German colonies.

There is now much talk among German Brazilians in regard to railroad projects. On this subject we have received, from an interested party in Porto Alegre, a memorandum giving detailed information concerning plans for a railroad from Porto Alegre, the capital of Rio Grande do Sul, to Pelotas, in the southern part of the same State. . . .

The railroad is to pass in the vicinity of the village of Pedras Blancas and the towns of Dores and Sao Joao de Camaquam. The plans are to be completed and presented within three years, and the road must be finished within six years. Within a zone of six miles on each side of the track, all land can be purchased by the company at the rate of 60 cents per hectare (2.4 acres), except such as has been utilized by the Government or is legally in the possession of private parties. The intention is that this land shall be used by the railroad company for the establishment of colonies of Brazilian and foreign farmers. The line is to be 174 miles long, with a gage of 1 meter. Most of the rolling, stationary, and floating material needed for the railroad and the steam ferry on the Guahyba River will have to be imported from abroad, and the State government will secure from the Federal Government exemption from duty for all such materials. With the advantage of this exemption from duty, the cost per kilometer will be about $6,000. The total cost is estimated at $1,800,000.

The railroads now in existence in the State of Rio Grande do Sul belong either to the Government (which has leased them to private concerns) or to English and Belgian companies. As has already been mentioned, the North Americans are now on the point of making their first investment of capital in Rio Grande. The projected Rio Grande Northwestern line is German, and it is chiefly a colonization enterprise. Porto Alegre and its "hinterland" has 500,000 inhabitants, of whom 250,000 are of German or Italian descent.

Fig. 1.—Chicago & Alton Terminal Coaling Station.

Fig. 6.—Chicago & Alton Main-Line Coaling Station.

The New Chicago & Alton Coaling Stations.

The coaling stations that the Chicago & Alton is building at various points have attracted the attention of railroad men who are trying to reduce costs in the fuel department. These stations, the idea of which originated with the railroad, were designed and installed by the Link-Belt Machinery Co., Chicago, and we are indebted to Mr. Staunton B. Peck, Vice-President and Chief Engineer of that company, for drawings and other information.

There are 10 of these stations and the project embodies three features that are novel and worth special attention:

First. The stations are distributed over the entire line of the road from Chicago to Kansas City. Other railroads have put in, and are putting in, modern, labor-saving coaling stations, but the Alton is said to be the first to adopt a complete equipment of these stations for its entire line.

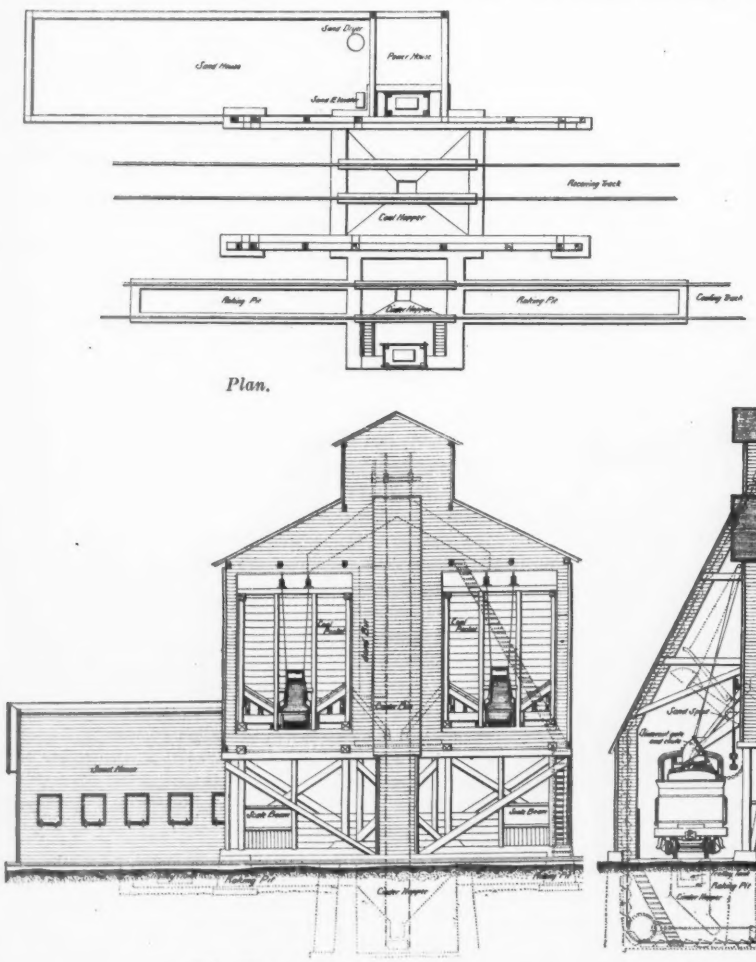


Fig. 2.—Chicago & Alton Terminal Coaling Stations—Designed and Built by Link-Belt Machinery Co., Chicago.

Second. Provision is made for automatically and accurately weighing the coal supplied to each locomotive.

Third. The arrangement of the stations is such that locomotives receive their supply of coal, water and sand, and discharge the cinders from fire-box and smoke-box simultaneously and without shift of position, thus saving time, labor and track room.

The stations are of two general types, terminal and main line. The terminal stations are at Kansas City, Slater, Roodhouse, Venice and Bloomington; the main-line stations at Odessa, Farber, Ridgely, Tallula and Virden. The former have two scale pockets of 70-tons capacity each, together with overhead cinder and sand bins, and a sand storage shed. The Bloomington station is modified by having no provision for cinders. The main-line stations have a single 70-ton scale pocket only, with the exception of Virden, which has a sand equipment in addition.

Figs. 1 and 2 show a terminal station. The coal is received on the supply track, which runs beneath the pockets, in self-clearing steel cars of 50 tons capacity, 170 of which the Alton has provided for the exclusive purpose of handling coal for its locomotives. These cars are dumped into the track hopper from which the coal is fed automatically and with uniformity to a Link-Belt carrier having a continuous series of overlapping buckets, 24-in. pitch by 36 in. wide. Fig. 3 shows this carrier, together with the automatic feeder and the rotary discharging device at the head of the elevator. These are two important features and are essential to the successful handling of mine-run coal by a continuous elevator. Prior to the introduction of the feeder, it was impossible to feed the coal to an elevator through a hopper with any uniformity, since, if the opening in the hopper were made of sufficient size to prevent the large lumps from choking it, it would permit the coal to come out with too great a rush when the lumps happened to run smaller. With this automatic reciprocating feeder the opening in the hopper may be made of such a size that the largest piece of coal cannot choke it and yet the flow of the smaller coal from the hopper may be perfectly regulated. The rotary discharge head permits coal to be carried over the head wheel of the elevator without spilling, and prevents large lumps of coal, which may project over the buckets, striking and doing damage. Fig. 4 shows a perspective view of the elevator buckets and discharge head. Delivery of coal is made by the carrier to the coal pockets which are mounted directly upon 90-ton Monarch scales, the beam box being placed on the ground for easy access as shown in the views.

The overhead cinder bin is between the coal pockets, and the same carrier that handles the coal also elevates

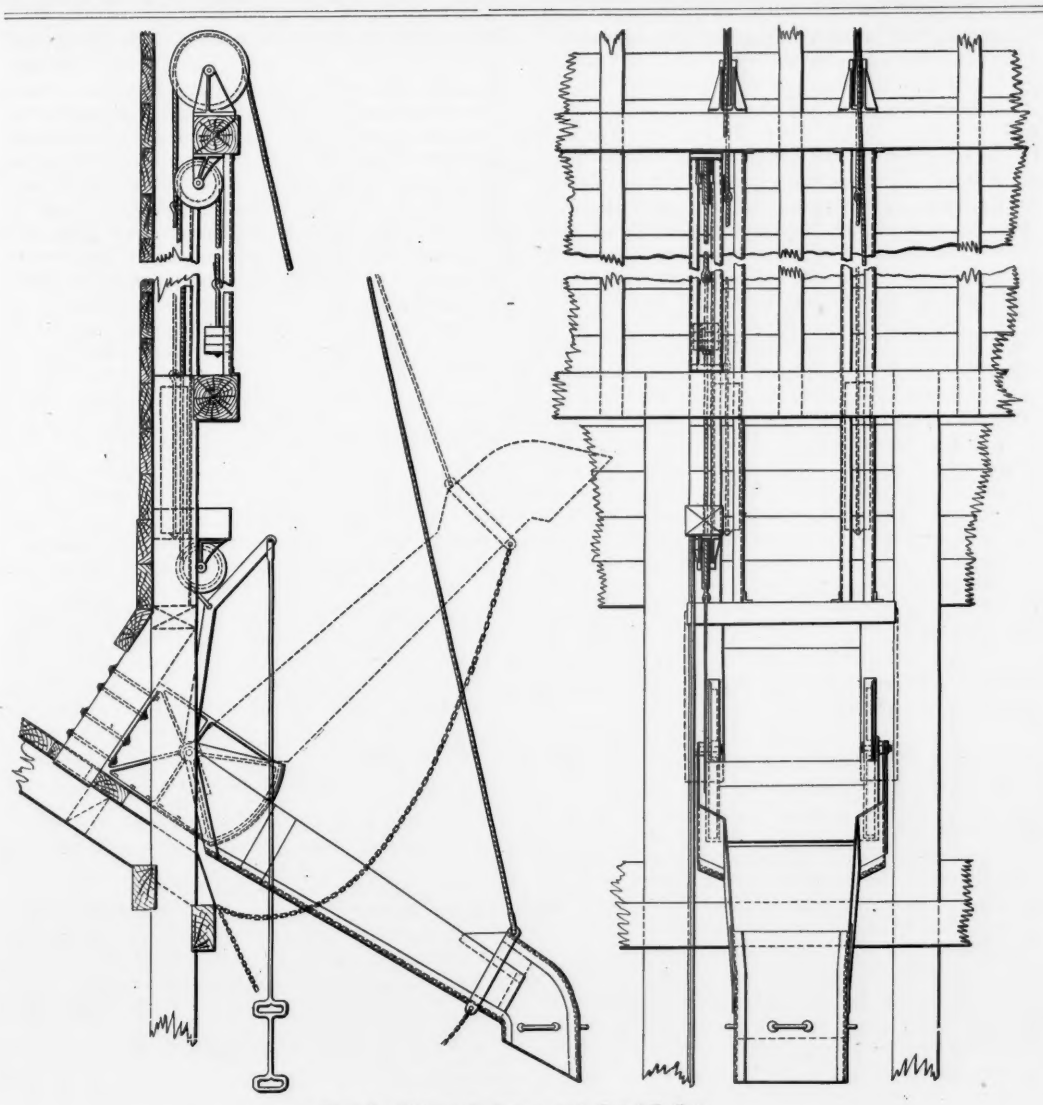


Fig. 5.—Balanced Apron and Cut-Off Gate.

the cinders. The carrier receives them from the steel hopper in front of the building and beneath the locomotive coaling track. Cinders may be drawn directly into this track hopper or into the small steel trolley tanks in the pit beneath the coaling track, these trolley tracks being pushed over the cinder hopper and dumped when full.

The sand is shoveled from cars on the supply track through windows into the sand shed, shown in Fig. 2. In this shed is a drying stove and sand elevator which elevates the dry sand into an overhead pocket, from which it may be drawn as needed for locomotives.

When a locomotive is to receive coal, the pocket is balanced by the upper scale beam. After the draft it is again balanced by the lower beam, which gives immediately the weight of the coal drawn from the pocket. This weight is recorded in triplicate on a card by a registering device on the scales, the card afterwards being torn into three portions, one for the engineman, one for the coal chute attendant, and the third for the Division Superintendent. The balanced apron for supplying coal to the tenders, and the cut-off gate (Fig. 5) are important details. The apron is of ample size to permit very rapid coaling and is provided with a hood at the outer end to cause the coal to drop directly on the tender, and not flow over it. In form the gate is a part of a cylindrical shell, and checks the flow of coal by cutting upwardly into it, this arrangement permitting the use of very large openings in the coal pockets to prevent choking of the coal.

The terminal stations being near steam plants are operated by 14-h.p. steam engines with the exception of Bloomington, where an electric motor is used. The arrangement and operation of the main-line stations (Fig. 6) are similar to the terminals except that they have but one scale pocket, and there are no cinders to be taken care of. For this reason it is unnecessary to have the carrier span the locomotive coaling track, which, at these stations, is the main line and is entirely unobstructed. These stations are all operated by 15-h.p. Otto gasoline engines.

On account of the nearness of these stations to the coal mines it is not necessary to provide much coal storage. But should this ever become desirable, the arrangement contemplates placing a 300-ton bin behind the stations, so located that the bin may be filled by the carrier, and the coal drawn from it by gravity into the same elevator and placed in the scale pocket.

The services of but one man are needed to operate the stations during the day, and one man at night. The only duty required of the latter is to take readings from the scale beams for the various drafts of coal. It is not necessary to run the machinery during the night.

These stations are very substantially framed, and are built of long-leaf Southern pine throughout. All the roofs are of slate and the buildings are sheathed with drop-siding, and painted with the railroad's standard color, giving them a neat appearance. The pits beneath the ground are made of concrete and are light and roomy, so that ready access may be had to all parts of the machinery. The Link-Belt Machinery Co. has covered by patents the various parts of the machinery, and applications are now under consideration in the U. S. Patent Office on the general scheme of the stations.

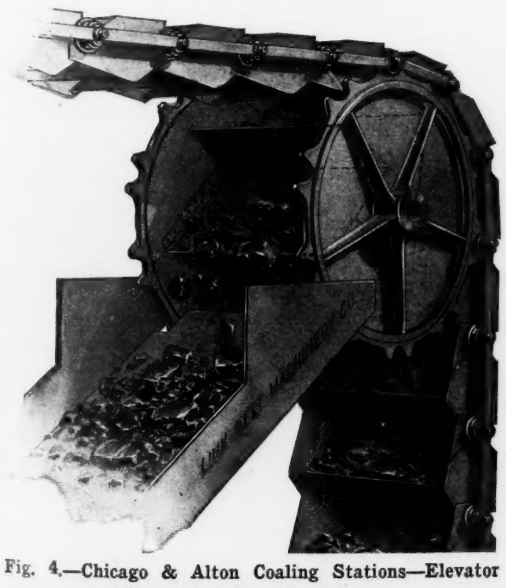


Fig. 4.—Chicago & Alton Coaling Stations—Elevator Buckets and Discharge Head.

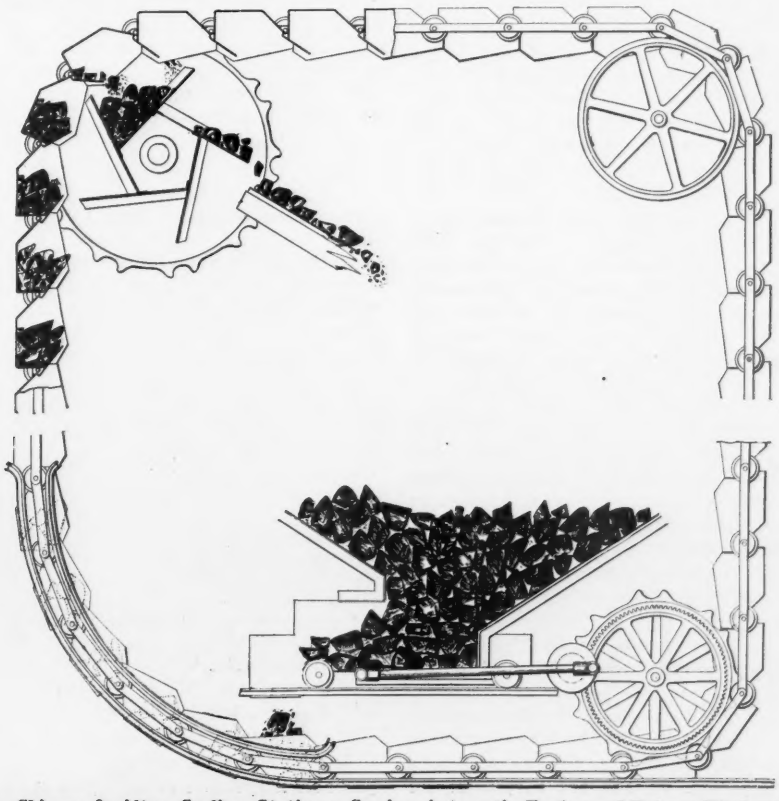


Fig. 3.—Chicago & Alton Coaling Stations—Carrier, Automatic Feeder and Rotary Discharge Device.

Foreign Railroad Notes.

The French Minister of Public Works has published a statement of the length of railroads in the different countries in Europe in 1899 and 1900, thus coming down to a later date than the statistics of the railroads of the world in 1898 compiled for the Archiv für Eisenbahnwesen, which we published last summer. The total mileage for Europe is given as follows:

	1900.	1899.	Increase.	Per Cent.
Miles	176,212	172,988	3,224	1.9

The average increase per year from 1894 to 1898 was 3,807 miles. Nearly one-third of the increase in 1900 was in Russia, and it must be remembered that this does not include the lines built in Asia then. Austria and Hungary together built 379 miles, France 381, Sweden 371, Prussia 362, Russia 1,034 miles. Including Finland, Russia in Europe now has a greater mileage than any other European country, but not one-seventh more than France, which has one-third of Russia's population and one-ninth of its area.

Shippers of perishable goods in Russia have complained that sometimes their freight has been spoiled in the tight box cars for lack of ventilation. To remedy this, it has been ordered that such goods be shipped in cars with ventilators, with a special charge of 13 cents for every ventilator opened, or 26 cents per car. Air must be dear in Russia.

The Austrian Railroad Club, one of the most successful organizations of the kind, whose birth was greeted by the *Railroad Gazette*, celebrated its 25th anniversary Nov. 23. The Club has many technical lectures, publishes a very good weekly newspaper, and has innumerable social functions. The Railroad Minister and many high functionaries took part in the celebration.

The Belgian Minister of Railroads has announced that employees, with certain exceptions, may be permitted to live at a distance not more than 22 miles from the place where they do their work.

A company of 284 men of the Prussian railroad brigade was practiced in bridge construction near Berlin recently, where they built a railroad bridge 163 ft. long over a sand-pit, fitting the piles and other timbers, in three days and three nights. The bridge was then tested by a car loaded with 14 siege guns of an aggregate weight of 66 tons, which was drawn slowly back and forth over the structure by ropes.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Arrangements have been made by which members of the American Society of Civil Engineers may have searches made in the library of the Society at cost. The work will be done by the Secretary's staff under his direction. Theoretically this ought to be a convenience, especially for out-of-town members; whether or not it will be actually useful remains to be seen. Obviously, the efficiency with which the work is done will depend considerably on the skill of the searcher, and it is reasonable to suppose that his skill will improve with practice. Therefore, it would be a good plan for members of the Society to throw into the Secretary's office all the work of the kind that they can, and so try to build up a little staff of experts. An experiment need not cost much and the service may grow into something useful.

Our Construction Supplement of new railroad and bridge work in the United States, Canada and Mexico accompanies this issue of the *Railroad Gazette*. As heretofore, this Construction Supplement contains a list of new railroads and also of extensions and important improvements of old roads either building or proposed. An attempt is made to show the present status of each project and to indicate the fact wherever work is in progress. So far as can be learned, names and addresses are given of operating officers of the newer companies, and also of contractors where contracts have been let. The Supplement also contains a list of important railroad, city, county and other bridges on which contracts, so far as known, are yet to be let. No attempt, however, is made to mention the bridges required by all new railroads building, as this work is generally included in construction contracts. The Construction Supplement is not simply a summing up of material that has from time to time appeared in the columns of the *Railroad Gazette;* it contains a large amount of information supplied by letters from railroad officers and from other official sources and now for the first time made public. Extreme care has been taken to make the Supplement as complete and accurate as possible.

The terms of office of one or more of the New York State Railroad Commissioners will soon expire, and the newspapers have published numerous items about various men whom Governor Odell was supposed to be intending to appoint. So far as we remember, every one of these items refers either to a politician or to a man said to be a personal friend of the Governor. We do not know that the newspapers have any ground for their guesses; and certainly as far as personal friends are concerned, this Governor has thus far given no cause for criticism of his appointments on this score. He has, on the contrary, received and deserved much praise for the independence and true public spirit which he has shown. But even if the classifications of these various candidates are correctly reported, we are not surprised; for many thoroughly well-meaning persons believe that a railroad commissioner should be "one of the people"; and on that theory a Governor would not be blamed for selecting men prominent in his own party. Unfortunately, a large share of the men prominent in party politics are not prominent by reason either of eminent public service or conspicuous technical ability. But whatever the majority of public men think, or whatever the controlling theory may have been in the past, there is no question that a railroad commissioner should possess a large fund of real and intimate knowledge of railroads; and the need of this was never more obvious than to-day. Every year, propositions are brought forward to entrust the railroad commission with new or more important powers, as for example, that to empower it to decide important questions in connection with the enlargement of the Grand Central station in New York City and the introduction of electric motive power. The Governor ought to be able to find a man "of the people" who is also a man of railroad knowledge. When an organization of merchants sets out to find a man with railroad experience and ability who will use his experience and ability wholly for the benefit of the merchants, they find him. There is one railroad man on the New York commission now, but apparently he does not always succeed in making technical knowledge or practical railroad ideas prevail with his colleagues.

Governor Odell has an advantage not enjoyed by most governors, in that he is able to pay a salary which will command the services of a man of ability. Many States have weak railroad commissioners because they pay but little money and very little honor. New York not only pays a liberal salary, but it is a large State, with good material to select from. Without stopping to look over the list of retired railroad officers whom we know to possess the first two qualifications—integrity and public spirit—we are sure that there must be several such who would be available, if they could be assured that the office would be made free from political influences. If the retired men are all too old there must be younger men still in active railroad work who would give the State valuable service—though we could hardly advise a young man in railroad service to accept such an office, for in the present circumstances it demands unnecessary self-sacrifice. We feel less compunction in the case of older men, as public service is more clearly one of their duties. Old or young, and whether easy to find or not, the State needs a man possessing the mental training of an educated engineer, so that technical questions can be dealt with intelligently; and having real knowledge about dealing with large numbers of workmen, so that he shall not treat strikes or employees' complaints on the basis of sympathy alone—beautiful and useful as sympathy is. He should have that intimate knowledge of the relations between the railroad and the public which, in this country, can be found only in those railroad officers who have to meet passengers, freight shippers and owners of full-blooded cattle which feed along the track (and get killed). The State ought to be able to find such experience in its own official force, but that cannot be until we have more thoroughly learned the art of government. Having no well settled civil service for training railroad commissioners it must get them from the railroad camp—even if that camp be looked upon as that of an enemy.

The American Society's Special Committee on Rails.

At the last meeting of the Board of Direction of the American Society of Civil Engineers certain members of the society were appointed as a "Special Committee on Rail Sections." The duties of this committee as outlined in the ballot are as follows:

1. To report upon the results obtained in the use of rails of the sections presented to the Society in annual convention, Aug. 2, 1893, by a special committee appointed for that purpose.

2. To report whether any modification of any of said sections is advisable, and if so to recommend such modification.

3. To report upon the recognized practice as to chemical composition and mechanical treatment used in the manufacture of rails, and the manner of inspection of the same.

4. To report upon the advisability of the establishment of a form of specification covering the manufacture and inspection of rails.

5. If found advisable, to recommend a form of specification for the manufacture and inspection of rails.

The committee is the outcome of an appreciation which began to be felt a year or two ago of the probable importance of modifying the section with a view to recent developments in mill practice. We are not at liberty yet to give the names of the gentlemen appointed on the committee, but it goes almost without saying that the committee (12 men) is a strong one, and representative of all the interests involved. Two of its members are also members of the Committee on Rails of the Engineering and Maintenance of Way Association, and eight out of the 12 are members of that Association. Thus, the two bodies are likely to work together, which is to be desired for every reason. In the movement which resulted in the appointment of this committee the Maintenance of Way Association acted before the older society, for very natural reasons which we need not go into now, but at last the movement is started in the American Society of Civil Engineers, and the direction, speed and extent of the movement depends on the committee.

The committee is charged with much broader duties than were anticipated or asked for by those who brought in the resolution under which it is appointed. Its scope includes the whole art of making rails; its only limit is in the industry and zeal of the committee.

Considering all these facts it is doubtful if it will be expedient for the Rail Committee of the Maintenance of Way Association to attempt this year to recommend anything as to sections, specifications, mill-treatment, chemistry or inspection. The Association has done the best work that it could do for the present in getting the society under way. Now, it will do well to "sit tight" for a year and let matters take shape.

The Committee Work of the Maintenance of Way Association.

A valued correspondent, who writes on another page, expresses dissatisfaction with the committee work of the American Railway Engineering and Maintenance of Way Association, and suggests what seem to him to be some of the actual defects and some of the remedies.

He says that while much has been attempted little has been done to unify or standardize specifications and requirements. This, he thinks, is largely because the committees are so big, so widely scattered, attempt to cover so much ground in one report, and finally because some of the members of the committee have but a slight sense of their duty towards the Association.

This is true to a greater or less degree of committee work in pretty much every organization with the working of which we have ever been familiar. Committees of technical organizations fail frequently, and we might almost say usually, to realize the expectations with which they were appointed. Whether or not the committee work of the Maintenance of Way Association has been as satisfactory as the members of the Association have a right to expect we are not prepared to say. Some excellent reports have been presented; some indifferent ones; and some that are pretty poor; which is to say that the experience of the Association has been that of most bodies at all like it.

The Association now has 15 standing committees of which there are 123 members, or a little over eight to the committee. The biggest committee has 13 members, and there is one of 12. If anybody will look carefully over the programme of the organization he will see the theory on which these committees were constituted. Each one of them is a general committee on some one pretty broad subject, and this subject is divided into several subordinate topics. No doubt, the theory was, and probably the practice is, to name sub-committees to report on these special topics, the general committee finally consolidating the matter into one general report on the general subject.

Theoretically this seems to be a pretty good arrangement, and why should it not work? The chances are that the general report will be ragged, good in some spots and poor in other spots. Occasionally there will, no doubt, be a thoroughly well co-ordinated and conclusive general report. But after all, what difference does it make whether we have a lot of good special reports, made by sub-committees, combined finally into a more or less good general report; or make each one of these sub-committees actually an independent committee, each making its own report directly to the Association? The result is probably as broad as it is long. The Association can, if it chooses, adopt any part of the general report and send the rest back for further consideration. In fact, the present arrangement amounts almost to dividing the Association into chapters, like, for instance, the American Association for the Advancement of Science, the difference being that each chap-

ter reports and debates in the general meeting of the Association.

But whatever the committee plan, it is probably true that the programme laid out for any one year is too big for adequate treatment. It is quite possible that as time goes on some change will be made in this particular; but it does not strike us that the present arrangement of committees is necessarily bad, or that we should be much better off if the committees were small and more compact.

Our correspondent does, however, make one suggestion with which we can agree thoroughly, namely, that any man who accepts a place on any one of these committees should do so with willingness to work and expecting to work, and that if he is absent from two consecutive committee meetings his place should be declared vacant. This is an excellent notion. We are familiar with one big committee, meeting monthly during the season, where one absence involves a cash fine, and two absences (without formal excuse by vote of the committee), vacate the place. The cash fines are sufficient to provide a pretty good supper for the committee at every meeting, but a man never risks being dropped for non-attendance; the plan works well. The vanity and irresponsibility which induce a man to accept a place on such a committee, when he is not prepared to do his share of work, are common human qualities, but a little discipline helps matters a good deal.

Annual Reports.

Central Railroad of New Jersey.—The annual report for the year to Dec. 31 last is issued in entirely new form, containing detailed records of the company's earnings, traffic, train and other operations in the year, comparable in extent of information covered, with some of the most complete reports of other companies. Heretofore the record of the year's operations, as made public in the annual statement, has been a balance sheet and a much condensed income account with a hundred words or so of text. The report of 1901, which covers operations for nearly a year, under the control of the Reading Company, not only has full details for the past year, but also contains many tables showing comparisons of earnings and of traffic statistics over the five years of Vice-President Warren's administration of the operating department, during which time have been put in force new methods of handling trains and traffic.

On this the report says: "The change in methods of assembling and handling freight trains, inaugurated in the latter part of 1897, has been continued and further perfected, and the benefit resulting from this change, together with that following the use of heavier power and larger cars, delivery of which was commenced in 1899 is clearly shown by the changes in train statistics, and also by the very material reduction in the cost of conducting transportation for the past year. Tons transported one mile increased in 1901 by 10.2 per cent., while the cost of conducting transportation increased but $11,040, or only .26 of 1 per cent. Notwithstanding the fact that the length of haul on the freight business continued very small (each ton of freight having been moved an average of only 79.29 miles) for the past year, the company reached an average of 471 tons of revenue freight per train per mile."

As regards changes in earnings, it may be pointed out that in 1901 transportation earnings of the rail lines rose above $15,000,000 for the first time, showing an increase of $1,311,000 for the year, with a decrease of $53,100 in expenses. Equipment expenses decreased $82,100 (the shops were closed by a strike), but transportation expenses show increase of only $11,000, so that it remains practically true that this heavy gain in receipts was accomplished without expansion of expenses.

The coal department of the company's operations shows the most favorable results in revenues. The gain in coal earnings, $947,200, was nearly three-fourths of the total enhancement in transportation revenues, merchandise freight adding $329,400 to this total. Comparison of the changes in these two classes of freight over a series of years show, however, much larger relative gain in the latter class of tonnage. The income account for the last two years and the figures for 1897 are shown below to permit comparisons, not only of the past year's operations, but with those in which the upward trend began and a new policy was introduced in the company's management. The figures follow:

Rail earnings:	1901.	1900.	1897.
Merchandise	$5,073,416	$4,744,039	$3,416,007
Coal	7,230,817	6,283,653	5,454,352
Total freight	$12,304,233	$11,027,692	$8,870,361
Passenger	2,602,746	2,569,085	2,281,333
Express and mail	293,877	284,272	290,992
Miscellaneous	85,853	94,597	125,642
Total gross	$15,286,709	$13,975,646	$11,568,328
Expenses:			
Maintenance of way	1,361,760	1,321,875	1,030,633
Maint. equipment	1,654,495	1,736,587	1,146,872
Conduct. transp.	4,201,405	4,190,365	3,794,507
General and traffic	607,587	629,519	503,719
Total oper. expenses.	$7,825,247	$7,874,346	$6,475,730
Net earnings	7,461,462	6,097,300	5,092,597
Oper. ratio, per cent.	51.2	56.4	55.98
Water lines, etc.	593,749	521,384	397,824
Int. on sec., etc.	1,309,376	1,236,318	698,139
Total income	$9,364,587	$7,855,002	$6,188,560
Taxes	402,949	351,781	341,063
Interest and rentals	5,098,155	4,883,858	4,760,880
Total charges	$5,501,104	$5,235,639	$5,101,943
Surplus for dividends.	3,863,483	2,619,363	1,086,617
Dividends	1,570,516	1,355,615	899,880
Surplus	$2,292,967	$1,263,748	$186,737
Imp., insur. and equip.	640,000	.....	.....
Balance	$1,652,967	.....	.....

The new prosperity of the company is indicated in the 1901 report in one way by a balance over expenses and charges of $3,863,000, or $1,245,000 over the 1900 surplus income, the surplus being equal to 14 per cent. on the outstanding stock. On the basis of these earnings, the dividend rate has been raised from 5 per cent., at which it has stood since 1897, to 8 per cent. With this 8 per cent. rate, however, established only late in the year, dividends actually paid in 1901 were 5¾ per cent., and practically all the surplus over this, together with other funds, seems to have been applied to betterment work.

This improvement work of course has gone on extensively in previous years, but on nothing like the scale adopted for the past year. The report enumerates expenditures of over $3,000,000 in improving the physical condition of the property and replacing equipment. The new motive power had a tractive power of 643,200 lbs. and replaced 18 engines with but 200,670 lbs. tractive power, and the new rolling stock, with a capacity of 82,000 tons replaced 1,610 cars with but 16,117 tons capacity.

The company now has under contract for delivery, beginning about June, 60 locomotives, 30 passenger train cars, 2,250 freight cars, of which 1,250 are coal and gondolas of 40 tons capacity, and 1,000 are box cars of 30 tons capacity, 60 refrigerator cars also being included in the deliveries. Not allowing for this new equipment, not delivered, a table shows a decrease of 20 engines in total owned on Dec. 31 last, as compared with Jan. 1, 1897, but an increase of 8,850,000 lbs. in total weight, an increase of 1,783,000 lbs. in tractive power of road engines, whose number increased by eight in this period. Of the old equipment 45 engines have been condemned and with their destruction and delivery of 60 new engines the increase over the 1897 figures will be in weight on drivers, 11,256,000 lbs., and in tractive power of road engines 2,304,000 lbs. Freight car equipment, on Dec. 31 last, shows decrease of 10,244, compared with 1897, all the old four-wheel cars having been destroyed, while the increase in carrying capacity is 135,836 tons, the average capacity increasing from 12.87 tons to 28.43 tons.

The figures below carry their own comment:

	1901.	1900.	1897.
Tons moved	17,596,843	16,256,821	12,200,443
Passengers carried	14,198,612	13,910,638	12,475,997
Tons 1 mile*	1,395,317	1,266,113	1,036,804
Passengers 1 mile	175,508,497	174,586,411	152,325,525
Loaded fr'ght-car miles.	61,971,574	59,295,055	67,193,806
Total car-miles	102,379,652	97,814,785	115,074,100
Passenger-car miles	12,700,984	13,258,483	11,275,472
Passenger train-miles	3,281,313	3,508,198	3,538,231
Freight train-miles	2,963,123	3,075,557	4,312,391
Total train-miles	9,988,986	10,123,453	10,447,401
Av. frt. rev. trainload.	471	412	240

* 000 omitted.

The decrease in movement, through doubling the average trainload is 1,350,000 train-miles, or 31 per cent. As one result of this economy of traffic handling, freight train-mile earnings are now $4.15, against $2.05 in 1897, although the change in ton-mile revenue in this period has been only from 8.56 mills to 8.82 mills.

The Attorney-General of the United States is preparing to proceed against various railroad companies at Chicago and elsewhere, as was predicted by the Washington reports of a week ago. The District Attorney at Chicago has received instructions to proceed against those roads whose officers, a few months ago, acknowledged, before the Interstate Commerce Commission, that secret rates had been made on their roads. Press despatches report that the district attorneys in Minnesota and Kentucky have received similar instructions. Mr. Day and Mr. Marchand, Agents of the Interstate Commerce Commission, have been appointed special assistants to aid the district attorneys. Commissioner Knapp is reported as saying that the testimony which was given before the Commission at Chicago was a great surprise to the Commissioners; and that it would be used as effectively as possible in proceedings against the roads. The Chicago reports of the dissolution of traffic associations which have appeared in so many different versions are summarized by the *Railway Review* as follows:

The railroads west of Chicago have for some time had traffic associations which they called committees. The original object was to hear complaints and settle differences through an arbitrator and thus to secure a legal regulation which would tend to prevent cutting of rates. The Chicago & North Western recently took the initiative toward the abandonment of these associations by withdrawing from those in which it was interested. Other roads expressed their determination to take the same course, and as a final result the Chicago-St. Paul, the Chicago-Omaha and the Chicago-Kansas City committees have been abolished. It is understood that the working of these associations, while not entirely satisfactory, was productive of much good. The members had extraordinary confidence in Mr. Geo. W. Ristine, whose duties were very similar to that of an arbitrator. It is probable, however, that the original intention of associated effort had gradually expanded and developed until there might be a question as to what the courts would decide if they were attacked under the Sherman law.

The only reason for saying "might be" in connection with the question about the legality of the committees, is that some court may, some day, return to the old view that common sense is to be exercised, as to the effect of a statute, when deciding upon its constitutionality. As long as the courts follow Justice Peckham's famous decision they must, under the Sherman law, hold every railroad rate agreement, or even temporary conference, of whatever name or nature, wholly illegal. For may not the simplest two-word agreement have the effect of steadying rates? And if it does have that effect is it not restraining competition, and thus illegal?

In the discussion of audible signals, which followed the Fourth avenue tunnel collision, some people, dissatisfied with the automatic apparatus, were inclined to turn to the English custom as the proper remedy for the faults developed in the use of the automatic machine. But Mr. Cade, who is well informed concerning English practice, advised against the adoption of manual fog signaling, declaring it unsatisfactory; and there is also the great objection that in this country fogs are so erratic as regards frequency, duration and density that the adequate maintenance of discipline would be a very difficult matter. "Fogging" would have to be done so rarely, comparatively speaking, that the men would not remember and strictly obey their instructions unless they were most thoroughly watched and drilled. But aside from this question of discipline there are other difficulties. In our issue of Feb. 28 we reported a collision on the Lancashire & Yorkshire which was partly due to the insufficiency of the fogging rules, or to inherent inadequacy of the system. Thus we have one more illustration supporting the theory that one signal well maintained is better than two, of different kinds, to supplement each other. It is not strange that runners should fall into the habit of depending on the shout of the man as an all-clear signal, for the idea of depending upon go-ahead rather than stop signals is based on an important fundamental principle, and a thoughtful engineman naturally finds and applies that principle. To-day we have a report of another English accident which was partly due to the same or a similar cause. During a dense fog on the evening of Nov. 23 a fatal collision occurred on the London & South Western at Malden. A goods train was standing at the station home signal, when it was run into by a passenger train, the driver of which had wrongfully passed the distant, inner home and outer home for Malden crossing box. The first-named signal was undoubtedly at danger, and it is assumed that the driver took the advance signal for the box in the rear, which was "off," as being Malden crossing distant, and missed seeing the latter signal, as it was on the wrong side of the line. The man also missed the outer home signal, as there was no fogman at it; and when he reached the inner home the fireman said it was "off," but there is every indication that herein he was wrong. Any careful American runner would say that but for the expectation that the fogman would give his all-clear signal, this engineman would have made sure to see the home signal with his own eyes. On the 16th of November there was a collision on the South Eastern & Chatham, which is attributed by the Inspector to the existence of an obscure or deficient phrase in the rules for signaling during foggy weather. The Malden collision also affords another example of inefficient inspection of electrical block signaling instruments, which we had occasion to refer to in the article just mentioned, in connection with the accident at Turnham Green, which is on the same road as Malden. The inspector again says that the inspection is not thorough enough. We do not need to repeat the dictum that refined safeguards require refined care and inspection, or that in increasing the number of safeguards we increase our cares in geometrical ratio; but we may well refresh our memories by observing these new evidences of old truths.

NEW PUBLICATIONS.

The Mechanics of Engineering. Vol. I.: Kinematics, Statics, Kinetics, Statics of Rigid Bodies and of Elastic Solids. By A. J. DuBois, Professor of Civil Engineering in the Sheffield Scientific School. New York: John Wiley & Sons, 1902. $7.50.

This quarto volume of 634 pages is one of the Yale bicentennial publications. It contains, in the main, the matter issued by the author some years ago in a three-volume work called "Elementary Principles of Mechanics," but this matter has been re-arranged, re-written and doubtless has been much improved. There are also introduced many new discussions of engineering problems, such as dams, walls, arches, swing bridges and suspension systems. The author's well-known "Stresses in Framed Structures," which is soon to be revised, is to form the second volume of this new series.

The importance of clear and comprehensive notions of mechanical principles, to students in every branch of engineering cannot be overestimated. Mass, density, center of mass and moment of inertia turn up in almost every problem involving the motion of bodies, and these fundamental ideas are well treated at the very start in 37 pages. Then follow 116 pages on kinematics—more, perhaps, than are necessary—while pure dynamics, statics and kinetics occupy the following 230 pages. Dynamics is the science of force and other related qualities, and it is divided into statics and kinetics, relating respectively to bodies in equilibrium and in motion. All the laws and principles of these branches are set forth in great detail and are illustrated by many theoretical and practical examples. It is safe to say that the student who has thoroughly mastered these pages has a mental equipment of high value. Lastly 230 pages are devoted to the statics

of rigid and elastic bodies and here the discussions of engineering problems are found.

It is only from the engineering point of view that we feel able to discuss the volume, and at the first glance our impressions are not favorable. The poundal, sometimes used instead of the pound, seems to introduce obscurity rather than clearness, especially as engineers never use poundals. The statement that one meter is 39.37079 inches is a strange one in view of the fact that the national scientific bureaus use exactly 39.37 inches, and stranger still is the information that one gallon contains 277.274 cubic inches and that one gallon of pure water weighs 10 pounds! The formulas for bending moments in beams have an unusual look, owing to the fact that the clockwise direction of rotation is taken as negative, which is not only contrary to usual practice, but which causes the familiar moment diagrams to become inverted. Bridge engineers will also be surprised to learn that structural steel, which they suppose has an ultimate strength of less than 70,000 pounds per sq. in., is here put down as 100,000 pounds, and that wrought iron, which they know cannot be broken by bending, has a modulus of rupture of 55,000 pounds per sq. in.! Some of these inadvertencies, it is true, may have resulted from the consultation of foreign books, but the practical problems given by the author indicate that he thoroughly believes in the application of his constants to the rupture of wrought-iron beams by flexure.

The discussion of the stresses in arches and suspension systems, due both to loads and to temperature, is presented in much detail, the principle of least work being used as a starting point. If correctly used this principle leads to correct conclusions, and we have found no errors in the author's demonstrations. This principle, however, is one of doubtful utility for the use of students, for, as Mr. F. H. Cilley has well pointed out in a recent discussion in the Transactions of the American Society of Civil Engineers, it is not a general law of nature, but a special law applicable only to materials which obey Hooke's law of the proportionality of stress and strain. In applying this principle and in developing the theory of arches it must be said that the author has shown great industry, and it is to be hoped that his labors may advance the correct design of these and other statically indeterminate structures.

The World Almanac for 1902 gives 24 pages to information about railroads which will be found convenient and useful to those who cannot keep at their elbow three or four different books of reference. There are general statistics from Poor's Manual and from the Interstate Commerce Commission. There is special information as to earnings, mileage, and officers of the principal railroad systems of the country. There are statistics as to number of employees, as to accidents, as to fast runs, as to traffic, and as to mileage by countries and by States. The names and addresses of the Interstate Commerce Commissioners and the various State Railroad Commissioners are also given. The volume contains 540 pages, besides the advertisements, and gives an immense amount of convenient information made available by a good index.

Proceedings of the Eleventh Annual Convention of the Association of Railway Superintendents of Bridges and Buildings. October, 1901. Concord, N. H.: S. F. Patterson, Secretary.

This is a pamphlet volume of 220 pages, containing officers, committees and a list of members of the Association. It contains also the papers, committee reports and discussions, presented at the last meeting, held in October at Atlanta. We published at the time a more or less complete statement of the subjects brought forward in these papers and reports. They cover a considerable range of construction and maintenance.

TRADE CATALOGUES.

The Joseph Dixon Crucible Co., Jersey City, N. J., has issued an eight-page souvenir mail card, containing half-tone engravings of a number of steel structures painted with Dixon's silica-graphite paint. One of the most interesting pictures shows a section of the steel elevated structure of the Pennsylvania R. R. in Jersey City, which was painted in 1890 with this silica-graphite paint, and repainted for the first time in 1901, when the same brand of paint was again used. The company states that its protected paint has been applied with success to structures in Australia, China, Japan, India and other tropical climates.

Hand Traveling Cranes.—Messrs. Pawling & Harnischfeger, of Milwaukee, Wis., send to us their Bulletin No. 5, just issued, describing hand traveling cranes. While cranes of this type are but a secondary feature of their business they are an important one. The building of electric traveling cranes is much the greatest part of the business of this firm. The cranes described in this pamphlet are of two principal types. The type A trolleys are made to be operated from the floor by means of pendant chains, and are built in capacities of from 3 to 10 tons. The type C trolleys for lifting loads varying from 10 to 40 tons are worked by hand cranks, the operators standing on platforms attached to the bridge, or in cages attached to the trolley. Cranes of this type may, however, be worked by pendant chains up to 20 tons. The details of these cranes are described at some length, and the cranes are shown from half-tone engravings made from photographs. A selected list of users is attached to the pamphlet.

Steel Plate Fans.—The American Blower Company, Detroit, Mich., has sent out a catalogue, No. 134, containing 66 pages, with good illustrations, and a great many tables of weights, volumes and dimensions, speeds and horse power, bearing on the operation of steel plate fans. There are full-housed steel plate fans of right and left-hand horizontal discharge as well as vertical discharge. A top angular discharge of 45 deg. is illustrated, and a similar fan for bottom angular discharge, both fans being belt-driven. Fans direct-connected to small independent engines and also motor-driven fans are illustrated, and these machines that we have mentioned are but a few of the interesting collection contained in the catalogue. There are some special journal bearings, self-aligning and self-oiling, water-jacketed if desired. The small pamphlet, No. 137, sent with this catalogue, has eight pages describing and illustrating the Morehead return trap, with instructions for setting up and using the device.

Protective Devices is the title of a new S. K. C. System Bulletin, No. 124. This bulletin describes the S. K. C. switchboard and pole-line fusible cut-outs, including the 30,000 volt ball fuse and the type F high-capacity fuse. A combined oil-switch and circuit-breaker switch, the circuit-breaker of the slide type, each break of which is provided with an arc-rupturing shutter, are also illustrated and described. The S. K. C. secondary protector, lightning arrester, ground detectors, etc., are other subjects of this publication. The bulletin is published by the Stanley Electric Mfg. Company, of Pittsfield, Mass.

Coal Handling Machinery.—The C. W. Hunt Company, West New Brighton, Staten Island-New York (and 45 Broadway, New York), issue a little pamphlet of 32 pages, devoted particularly to coal handling machinery. They call it a coal dealer's list. We shall not stop now to say what it contains, but those who have occasion to buy or install such machinery had better send for the pamphlet.

Measuring Tapes.—The Lufkin Rule Co., Saginaw, Mich., has sent out a small catalogue giving illustrations, descriptions and price lists of steel, linen and cotton measuring tapes for engineers and others. The list includes a variety of tapes that covers all ordinary use.

Small Motors and Generators.—We have received from the Northern Electrical Manufacturing Co., of Madison, Wis., a bulletin describing the Watson type of small motors and generators, which they have recently placed on the market. These machines have some new features. The frames are cast from electric steel and are multipolar. The armatures are also built on the same plan as followed in the construction of larger machines. They have slotted laminated cores laid with form-wound coils and arranged for perfect ventilation. In appearance they are neat, compact and symmetrical. At present the machines are built in sizes from ⅛ to 2 horse-power.

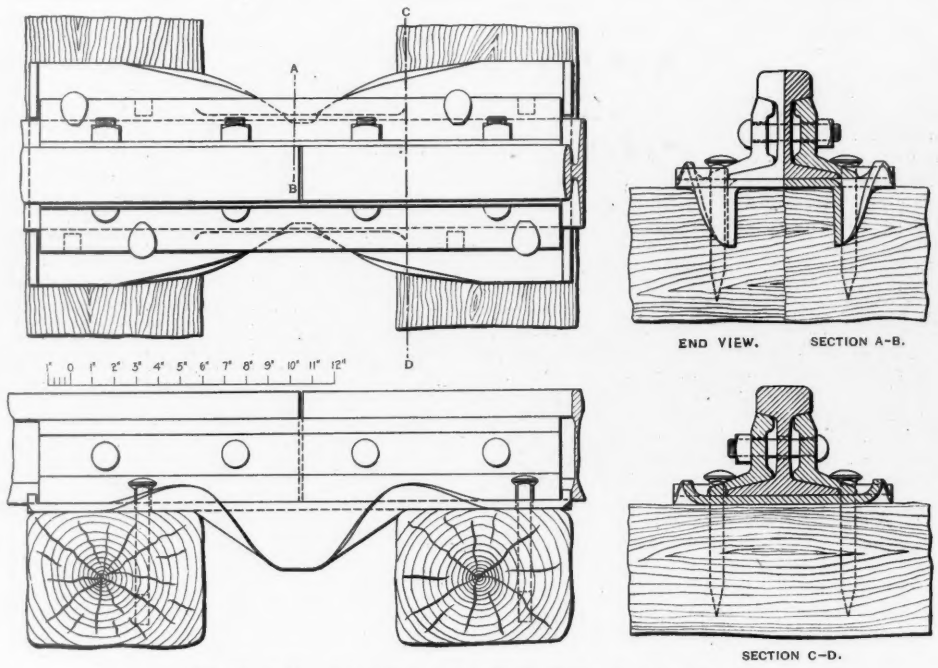
The S. A. Woods Machine Co., South Boston, Mass., has just issued a sectional catalogue, "A Few Leaders From Our Line of Car Shop Wood-Working Machinery." It measures 9 in. x 12 in. and contains 26 pages of illustrations and descriptions of the class of machinery indicated in the title.

Mechanically Operated Circuit Controllers.—This is the title of Bulletin No. 8, which has just been issued by the Union Switch & Signal Company, of Swissvale, Pa. It is a pamphlet of about 50 pages, describing in full detail the various devices made by that company for opening and closing electric circuits in connection with the movements of signals and switches. Each device is illustrated by carefully prepared perspective drawings, and for each there is a page of numbered details; thus making the pamphlet a perfect hand-book for ordering either complete instruments or parts for repairs. The most prominent thing in the catalogue is the company's well known Vertical Rotary Switch Box, of which over 2,000 have been put in service. This switchbox, for closing track circuits at outlying switches, is the fruit of long experience and has met with universal favor. Bonded rail joints and track connections are also shown, as well as numerous designs of circuit controllers for use in indoor situations.

A Bridge Joint Plate.

Mr. F. E. Abbott, Inspecting Engineer of the Illinois Steel Co., Chicago, has designed and patented a bridge joint plate for strengthening the common angle bar rail joint, without interfering with the use of angle bars. The principal object of the design is to provide additional strength without changing the angle bar.

This joint plate consists of a single piece pressed out of a flat ⅜-in. plate, of width and length to suit the size of rail and angle bars used. As shown by the engravings, the down-turned flanges at the center have a depth of 3 in. with a horizontal lower edge of 1½ in. The up-turned flanges extend from each end of the lower horizontal edge back towards the ends of the plate, 9½ in. each way from the center, making the total length of the flanging 19 in. The greatest depth of vertical metal is at the center, the point subject to greatest strain. The depth of the vertical metal in the up-turned flanges is



Abbott's Bridge Joint Plate—For 80-lb. Rail and Angle Bars.

zero at the maximum depth of down-turned flanges and maximum at the zero line of down-turned flanges, finally reaching the other zero limit near the center of the tie and 9½ in. from the cross center line of the plate. This combination of reversed flanging in reality forms a short deck bridge between the two joint ties. There is also a slight camber at the center of the plate to insure the rails first taking a bearing at the ends and bringing the plate into action before any deflection takes place in the splice bars. The end or corner lugs act as anti-creepers in preventing the joints from creeping off the ties, and they also act as guides to the rails, holding them in line in case the splice bars become loose.

The following is a summary of the advantages claimed: No special instructions are needed to show how the plate should be applied; in fact, it is so made that it cannot be put in wrong. Spike holes may be punched in each end to make it suitable for either the right or left side of the track and thus save the trouble of distributing the plates in pairs. The bridge joint plates can be easily put in after track laying is completed and are, therefore, applicable to any two-tie joints in either old or new tracks. In putting in switches and crossings, where ordinarily it is not practicable to use anything but angle bars, it is only necessary to leave the plate out and proceed with construction according to usual methods. It is claimed that the bridge joint plate makes a two-tie supported joint out of a suspended joint and reinforces the angle bars throughout their entire length. Further, that the base support reduces the strains on bolts, prevents the bolts from stretching and the nuts becoming loose, and that it also prevents wear on the top of the angle bars at the end of the rail head. One bridge joint plate takes the place of two tie plates and serves the purposes of such plates. It protects the ties against rail cutting, maintains correct gage and in addition pro-

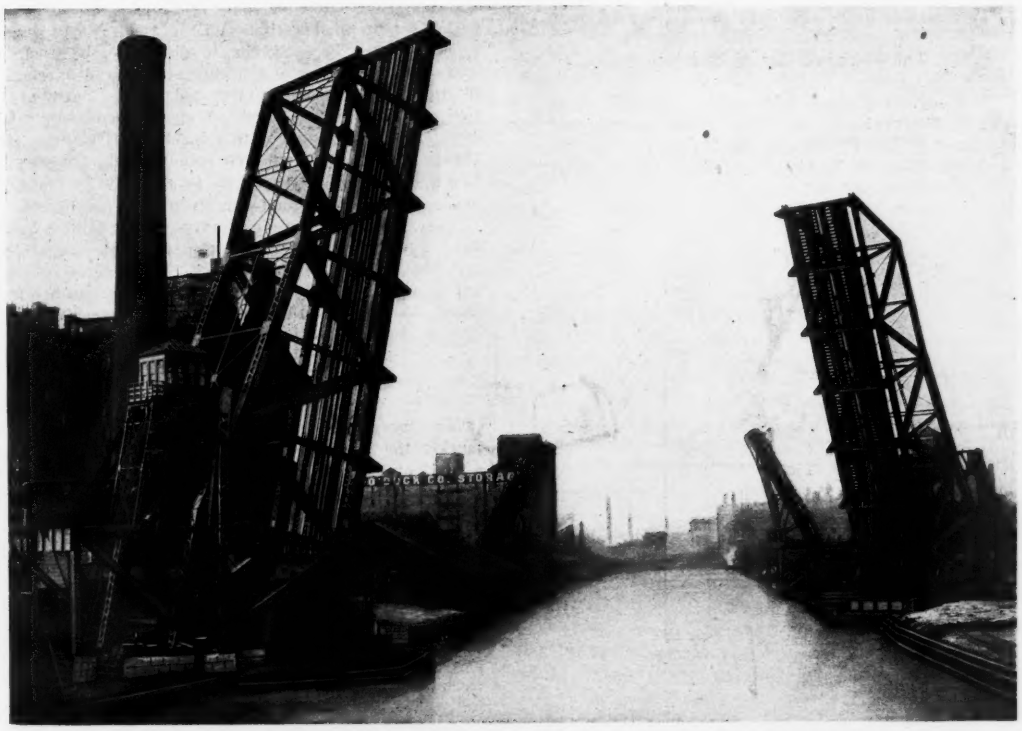
vides a connection or brace between joint ties independent of the angle bars. Where track is laid with even joints, this is considered of benefit in preventing tight gage, especially where the rail is disposed to creep more on one side of the track than on the other.

The joint plate being separate from the rest of the joint it will be made of harder steel, with greater elasticity, than that in the bars, and it is proposed to use steel of about 0.30 carbon for these plates. With 80-lb. rail, the vertical resistance of the angle bars is increased about 100 per cent. by the addition of the plate, thus making the whole joint about 80 per cent. of the strength of the rail. In lighter sections the increase is said to be still greater. These joint plates are suitable for any length of splices from 22 to 30 in. and for any weight rail from 45 to 100 lbs. per yard.

The method of flanging down the Bonzano joint will be suggested at once to the reader who is familiar with that joint.

Scherzer Rolling Lift Bridges.

At various times since the first Scherzer rolling lift bridge was built in Chicago, over seven years ago, descriptions of a number of the bridges which the Scherzer Rolling Lift Bridge Co., Chicago, has installed in different parts of the country have appeared in the *Railroad Gazette*. Among the many good points of the Scherzer as a movable bridge, perhaps the most important from both the engineer's and the user's standpoint are economy of first cost, of operation, of maintenance, and of the space required for site and operation. Additional advantages lie in its rapidity of operation, entailing as little delay as possible to traffic, and in the simplicity and rigidity of its parts.



New Scherzer Rolling Lift Bridge with Old Swing Bridge Removed—Chicago Terminal Transfer R. R.

Appreciation of the Scherzer bridge appears to be growing, judging by the increasing number that are being built each year, and the large number that the company has at present under construction, or for which plans are being made. Following is a list of the more important bridges that have been completed or are being built:

Van Buren street highway bridge over the Chicago River, for highway and electric car traffic; completed in 1895. Double leaf; span, 115 ft.; clear channel, 109 ft.; width of bridge, 57 ft.

Metropolitan West Side Elevated R. R. bridge over the Chicago River, for highway and electric car traffic; completed in 1895. Four-track bridge, consisting of two double-track structures side by side, operating singly or jointly. Double leaf; span, 114 ft.; clear channel, 108 ft.

North Halsted street highway bridge over the Chicago River, for highway and electric car traffic; completed in 1897. Double leaf; span, 127 ft.; clear channel, 110 ft.; width of bridge, 50 ft.

New York, New Haven & Hartford R. R. bridge at Boston Terminal Station, over Fort Point Channel; completed in 1899. Single leaf, six-track structure, composed of three double-track bridges, operated singly or jointly. Crosses river at an angle of 42 deg. Longest span 114 ft.; shortest span, 84 ft.; clear channel, 42 ft.

Cleveland, Cincinnati, Chicago & St. Louis R. R. bridge over Cuyahoga River at Cleveland, Ohio; completed in 1900. Single leaf, single-track bridge, operated by the steam engines of displaced swing bridge. Span, 125 ft.; clear channel, 110 ft.

Taylor street highway bridge, over Chicago River, for highway and electric car traffic; completed in 1900. Double leaf; span, 148 ft. 7 in.; clear channel, 120 ft.; width of bridge, 30 ft. 10 in.

Chicago Terminal Transfer R. R. bridge over South Branch of the Chicago River; completed in 1901. Double leaf, double-track bridge. To be enlarged to a four-track structure, consisting of two double-track bridges, operated singly or jointly. Crosses river at the very acute angle of 36 deg. 30 min. Span, 275 ft.; clear channel, 120 ft., measured at right angle to its center line.

Pittsburgh, Cincinnati, Chicago & St. Louis; Chicago Terminal Transfer and Chicago Junction railroad bridge over Drainage Canal. Built by the Sanitary District of Chicago. Completed and placed in service as a fixed bridge in 1900. Double leaf, eight-track structure, composed of four double-track bridges side by side, capable of being operated either singly or jointly. Span (movable portion), 168 ft.; angle of skew, 68 deg.; clear channel, 120 ft., at right angles.

Cleveland, Cincinnati, Chicago & St. Louis R. R. bridge, over Cuyahoga River, Cleveland, Ohio; completed in 1901. Single leaf, double-track; span, 120 ft.; clear channel, 100 ft.

Newtown Creek highway bridge, Vernon avenue, Brooklyn, N. Y., for highway and street car traffic. Under construction. Double leaf; span, 172 ft.; clear channel, 150 ft.; width of bridge, 62 ft.; total length of bridge and approaches, 1,699 ft.

New York, New Haven & Hartford R. R. Bridge over Pequonnock River, Bridgeport, Conn. Under construction. Single leaf, four-track bridge, composed of two double-track bridges, operating singly or jointly. Span, 88 ft.; clear channel, 80 ft.

State street highway bridge, over Chicago River. Under construction. Double leaf; span, 161 ft. 8 in.; clear channel, 140 ft.; width of bridge, 64 ft.

Middle Seneca street highway bridge, Cleveland, Ohio, over Cuyahoga River. Under construction. Double leaf; span, 138 ft.; clear channel, 120 ft.; width of bridge, 42 ft.

Canal street highway bridge, over Chicago River. Under construction. Double leaf; span, 188 ft.; clear channel, 140 ft.; width of bridge, 43 ft.

Randolph street highway bridge, over Chicago River. Under construction. Double leaf; span, 169 ft. 2 in.; clear channel, 140 ft.; width of bridge, 72 ft.

Harrison street highway bridge, over Chicago River. Under construction. Double leaf; span, 175 ft.; clear channel, 140 ft.; width of bridge, 60 ft.

Polk street highway bridge, over Chicago River. Under construction. Double leaf; span, 169 ft. 2 in.; clear channel, 140 ft.; width of bridge, 40 ft.

Eighteenth street highway bridge, over Chicago River. Under construction. Double leaf; span, 161 ft. 8 in.; clear channel, 140 ft.; width of bridge, 60 ft.

Main street highway bridge, over Chicago River. Under construction. Double leaf; span, 161 ft. 8 in.; clear channel, 140 ft.; width of bridge, 60 ft.

The February Floods.

The damage by the floods in New York and other Eastern States on Feb. 28 was so great, that as a matter of record, we have compiled a condensed account of the worst damage done to the important railroads named below. A brief account of these damages was given last week.

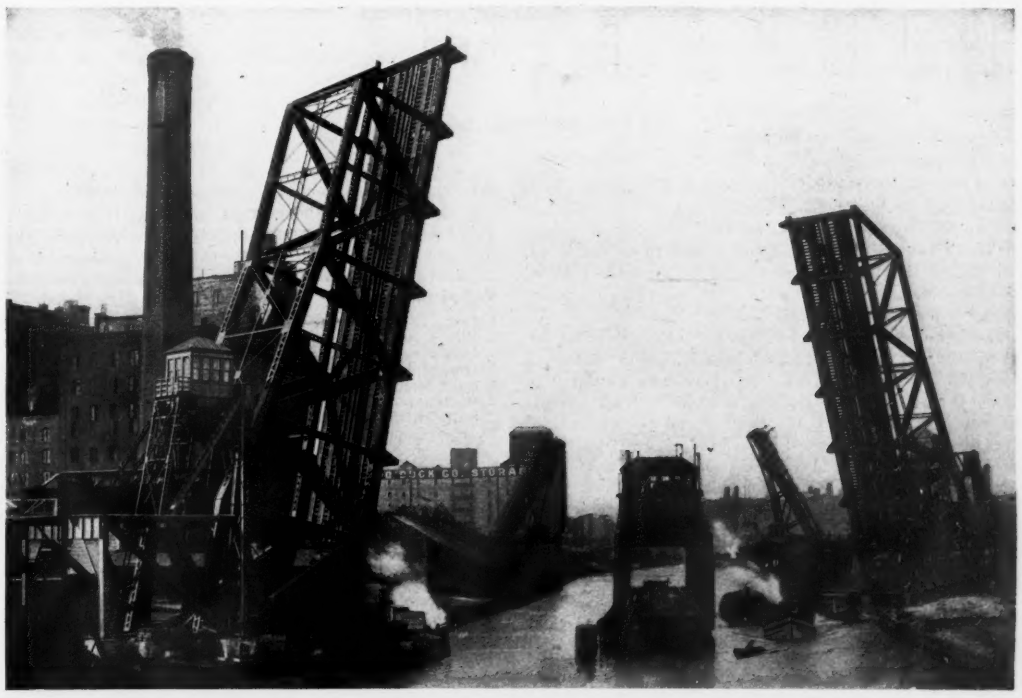
On the New York Central the blockade south of Albany was as serious as that of 1896, though the work of clearing the track did not have to be done under such extreme cold weather conditions as in the former case. An officer of the road sends the following notes.

Hudson Division.—An unprecedented gorge of ice in the Hudson River near Coxsackie caused the water to rise and cover the tracks with both water and ice for a depth varying from 2 to 10 ft. for nearly the full distance from Stuyvesant to Rensselaer, a distance of approximately 15 miles. Immediately following the rise of water and deposit of ice there was a lowering of temperature with a snow storm that very much embarrassed the situation and delayed relaying track and clearing the roadbed. This trouble started on the night of Saturday, March 1, and it was not until the night of Thursday, the 6th, that one track was restored to traffic. The second track was restored Sunday, the 9th. About 2,000 men were employed on this work. Passenger trains were sent from Albany via the B. & A. to Chatham, and thence to New York by two routes, the B. & A. branch to Hudson, and thence by the main line to New York, and by the Harlem Division direct from Chatham to New York.

Mohawk Division.—Extreme floods from the Adirondacks caused the breaking up of the ice in the Mohawk River with unprecedented height of water and gorges at various points that backed up water and ice over the tracks of the four-track main line at Oriskany, St. Johnsville, Fort Plain, Yosts, Sprakers, and Palatine Bridge, and at Ilion and Sprakers on the West Shore. This put the main line out of service during the 2nd and 3rd, but with the exception of a short period of about one hour all of the passenger trains were moved over the West Shore line on the south side of the Mohawk River, with comparatively small delays.

Western Division.—The four-track main line was covered with water and ice at Newark and Palmyra on the 2nd and 3rd, but passenger trains were kept moving over the Auburn Line.

Pennsylvania Division.—The tracks were covered with water and ice at many points immediately north of Corning and between Corning and Williamsport; also west of Williamsport. The movement of trains was re-



New Scherzer Rolling Lift Bridge, 275 ft. Span, with Old Swing Bridge Obstructing Channel—Chicago Terminal Transfer R. R.

sumed on the morning of the 2nd. On the Cowanesque Branch three wooden bridges were lost.

On the Harlem Division there were a number of slides, and a serious washout at Philmont, derailing a freight train and causing the death of three employees. This washout was at a railroad embankment that had existed intact since the original construction of the road in 1850.

The cost of the damage is roughly estimated at $250,000. The only serious damage to signals was within the area of trouble between Coxsackie and Rensselaer on the Hudson Division, where three signal towers were lost and where the posts and rods were damaged.

The inconvenience from damaged telegraph wires was chiefly between Coxsackie and Rensselaer, where, for a long distance, telegraph poles were knocked down.

On the Central of New Jersey all traffic was suspended in the valley of the Lehigh River for three days or more. The bridge at Glen Onoko tunnel was dislodged.

The losses of the Southern Railway on the Knoxville division, between Morristown and Asheville, were estimated to aggregate over $200,000.

The Delaware, Lackawanna & Western had a number of annoying washouts, but the damage to the roadway was light. An officer of the company says:

"Passengers of Friday night and Saturday (Feb. 28 and March 1) were delayed, getting through on Sunday. Also Sunday passengers from Buffalo to Hoboken and other points, and from Hoboken to Buffalo were delayed until Monday. None of our important bridges were destroyed or damaged. The cost of repair work on roadway and structures was about $5,000. I know of no damage to signals; the automatic signal service was not interrupted. Interruption to the telegraph wires covered perhaps 48 hours. There was no interference, however, with the operation of the road. Wires were down between Hoboken and Dover on both the old and the new road, also at Corning."

By the breaking of an electric light wire the railroad company's wires through the Hoboken tunnel were crossed and the high-tension current did so much damage that no block signaling could be done through the tunnel for many hours. The time-interval had to be employed, and during the busiest hours three trains were coupled together into one, so as to reduce the delay due to maintaining a long time interval.

The Pennsylvania Railroad lost its telegraph wires between Jersey City and Philadelphia, from Saturday night till Monday morning; but there was no delay to trains because the signals are worked by rail circuits without line wires. At Harrisburg and points west of there the main line was submerged, causing a long blockade of the main line; but we have no particulars of the damage done.

On the Lehigh Valley the obstructions were very serious, and lasted several days, but the trouble was mitigated by the fact that some of the obstructed sections were parallel to the line of the Central of New Jersey. These two roads each used parts of the other's line. Through trains were unable to make perfect time for more than a week. An officer of the Lehigh Valley writes:

Between Jersey City and Easton the only trouble experienced was the loss of a small bridge on the Pittstown Branch.

Between Easton and Mauch Chunk there were numerous washouts at various points, putting one or both tracks out of use for a short time, but no bridges were lost in this territory, except small ones on the Slatedale Branch and industrial tracks at Allentown.

Between Mauch Chunk and Coxton the worst damage was done. At Glen Onoko the upper track of the bridge over the Lehigh was damaged. At Penn Haven, one pier was undermined and two spans of both tracks dropped into the river. At White Haven, a pier was undermined and two spans of both tracks dropped into the river.

Between Penn Haven Junction and White Haven, a distance of 16 miles, the roadbed was damaged in a number of places, and between Wilkesbarre and Plainsville the tracks were badly washed for a distance of several miles.

Between Penn Haven Junction and Weatherly, on the Mahanoy and Hazleton division, a distance of five miles, the tracks were badly washed, in some places both tracks being taken out. Small washouts also occurred at various points on that division.

Between Coxton and Sayre, tracks were more or less washed at various points along the Susquehanna, but no bridges or other structures were lost. West of Sayre, on the main line, no serious trouble was experienced. At Rochester some damage was caused by the Genesee River overflowing its banks.

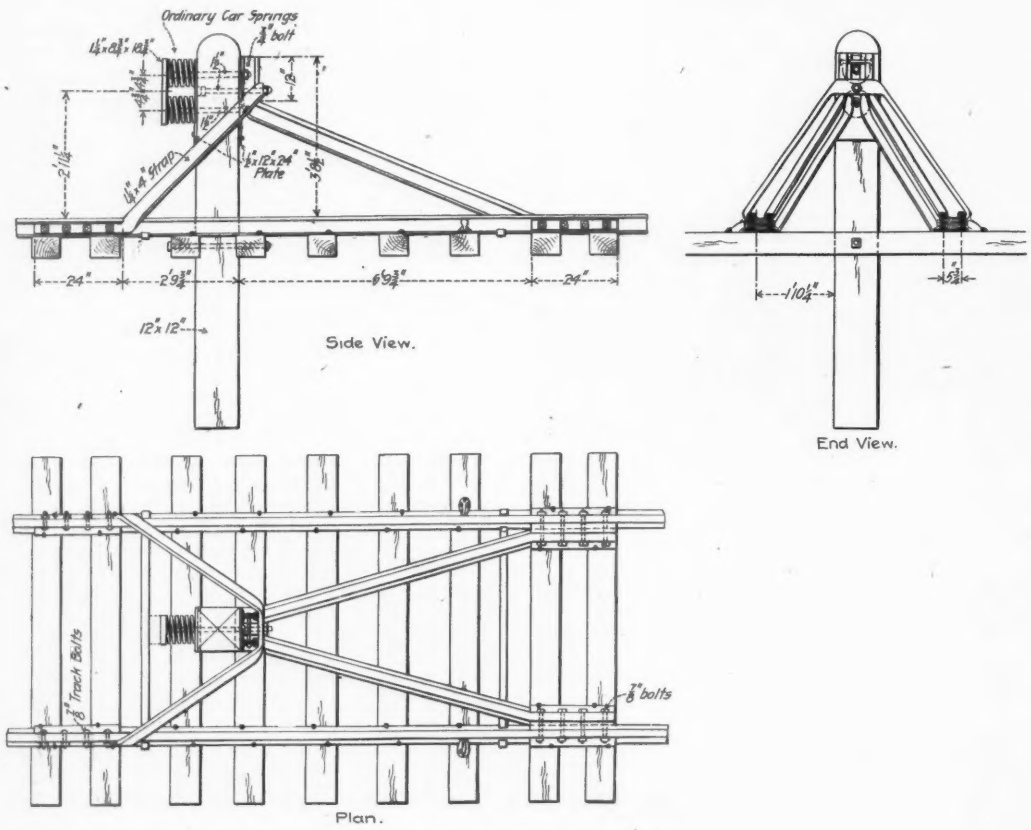
The telegraph and signal lines were badly damaged on the main line between Easton and Sayre, the floods in some cases carrying rails, ties, poles, signals and wires all down together.

The amount of damage will probably reach $250,000.

The Fairbanks-Morse Bumping Post.

The engraving shows a bumping post, now made and sold by Fairbanks, Morse & Co. This was designed and patented by Mr. P. Scanlan, Roadmaster of the Chicago & North Western Railway, at Boone, Iowa. It will be seen that it is a very substantial arrangement, and we are informed that the cost of installing it is considerably less than that of any other type now on the market. We are told, also, that it is going into considerable use on the Chicago & North Western. A list of material furnished follows:

1 Post, 12 x 12 in. x 8 ft.
2 Pieces 70-lb. rail, 10-ft. each.
1 Iron strap, 1¼ x 4 in. x 16 ft.
1 Iron plate, 1¼ x 8¾ x 18¾ in.
2 Split switch heel plates, ½ x 12 x 24 in.
2 Ordinary car springs.
2 Split switch filler blocks.
Bolts and angle bars.

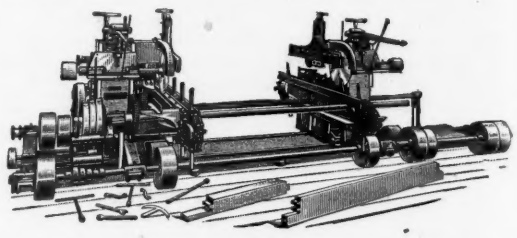


The Fairbanks-Morse Bumping Post.

A Russian newspaper published at Dalnie, the Chinese Pacific terminus of the Chinese Eastern Railroad (see *Railroad Gazette*, May 10, 1901) says that the traffic on the part of the road extending north thence to the main line is as much as can be conveniently handled with existing appliances, chiefly freight. The road is only provisionally open, in an incomplete condition, and doubtless construction materials form a large part of the freight. The rate is 48 cents per mile per car carrying 22,000 lbs. as far as Charbin, the intersection with the main line. At this rate one of our modern trains from Buffalo to New York would yield not far from $40 per train-mile, instead of the beggarly $4 or less it has to put up with. But the Chinese Eastern will have to come to time when it competes for trans-continental traffic.

A New Automatic Double Car Tenoner.

Messrs. J. A. Fay & Egan Co., of Cincinnati, have just brought out the new No. 8 automatic double car tenoner here illustrated. It has been the aim of the makers to have it as labor-saving as possible, and it being entirely automatic, all responsibility is taken off the operator as



to marking stock. The machine cuts to exact lengths, and each piece comes from it accurately worked and with great rapidity. The tenoner was patented June 15, 1900.

It will cut off and tenon material from 10 in. to 9 ft. long between shoulders, and will cut off and tenon both ends of timber to 24 in. wide and 8 in. thick. By cutting off the lengths on some other machine, dispensing with the saws on this, timbers 12 in. thick can be tenoned to advantage. Saws 22 in. in diam. can be used, and operating in advance of the cutter-heads, the burr raised by the saws is perfectly removed by the cutters, thus saving much valuable time. A special head is provided for making double tenons to 4 in. deep. There are eight tenoning heads, two on each spindle, and each carrying two knives cutting tenons 6 in. long, so that by using two heads on each spindle a tenon 12 in. long can be cut.

The machine is massive and perfectly built to stand hard work, and the adjustments are made quickly and accurately.

Prices, cuts of machine, full information and new combined 450-page catalogue, showing all machines made by the company will be sent free on application.

A New Spike Puller.

Mr. Charles Morrill, of New York, has just put on the market the Pearson "Cyclone" spike puller. It weighs a little over 30 lbs. and consists in detail of a cast-steel frame 23 in. high, into the top of which is screwed a 1⅛-in. tube 28 in. long, giving a total height to the tool of 4 ft. 3 in. Through this frame and tube passes a square rod having on the upper end a smaller rod attached, provided with a button for raising or lowering the rod. On the lower end of the rod is attached the spike gripping apparatus, which consists of a pair of Swedish steel jaws arranged to work on the toggle-joint principle. The rod is also provided with a set of ratchet teeth, which engage with a pawl, actuated by a cam on the end of a 38-in. lever handle. The leverage is so adjusted that for every 100 lbs. pressure exerted on the lever handle, there will be a lifting force of over three and one-half tons produced. In extracting a spike a second pawl, and a friction spring, prevent the rod from falling. The Cyclone spike puller saves wear and tear on the spikes and ties. A spike is extracted in the same condition in which it is in the wood, the hole in the tie is not enlarged, or the tie split. Time and money are saved, as only one operator is required. The chief saving in time will be in work between guard rails, bridges or similar places, where a spike may be as easily withdrawn, as in a place where there is plenty of room. The spike puller may be worked from either side of the rail. Experiments conducted by the United States government on the power required to draw a $^{9}/_{16}$-in. x $^{9}/_{16}$-in. spike 4¼ in. in wood, gave as results, from 2,000 to 4,000 lbs. and in the case of a spike that has been rusted and otherwise cemented in, the power required to extract it may reach 6,000 lbs.

The railroads of Natal, one of the two British colonies involved in the South African war, at the close of 1900 included 591½ miles, about one-third of which was light lines. At the beginning of the year, about two-fifths of the mileage was in the enemy's hands or disabled; in spite of which the earnings for the year amounted to about $10,000 per mile of road, and the net earnings were 4½ per cent. on the capital—the army paying roundly for the great amount of transportation it required. There are coal mines on the Colony's roads, and one of these roads affords the shortest outlet to the sea to the Johannesburg mines, which in time of peace is of great importance. The most notable fact in the experience of the Natal railroads is that no less than 2,531 of their 3,828 employees are natives of India. The existence of such a stock of laborable and willing to work in a tropical country, is the very first requisite for the development of tropical Africa, on the border of which Natal lies.

Some Opportunities for Engineers.

The following extracts are from an article by A. W. Buel, C. E., published in the Rensselaer *Polytechnic*, of Jan. 25, under the heading "Some Opportunities for Engineers in the New Insular Possessions of the United States":

"In Porto Rico there are a number of native engineers, graduates of many of the engineering schools of Europe and America, but Rensselaer is as well represented as any other in numbers and unexcelled in quality. Competition is not wanting and the communities are as discriminating in their judgment of engineering works as many of our own. In fact, due to some good examples left by the Spaniards, they are often more critical than communities in the States of similar size and wealth. Therefore, engineers should not hope to go to our tropical possessions to dispose of inferior services for large rewards, but should be prepared to offer as good service as is demanded here for the same class of work.

"The opportunities existing in these islands are such that the 'general practitioner,' if the term may be applied to engineers, has the advantage over the specialist. The field for the specialist, in any line of work, is the metropolis or the industrial center of that line. The professional specialist is the product of the high state of organization and division of labor in the modern metropolis or center of production. He can no more exist than he could be produced in a rural community and if transplanted to such he would speedily degenerate to a general practitioner simply from lack of new experience in his specialty.

"The young engineer should consider two things before choosing a career in these far-away islands:

"First, if he is ambitious to excel as a specialist in any line selected or to be selected—and it is the intensified specialists who generally excel—then let him strive to work and gain his experience in the greatest center of the specialty selected.

"Second, if the kind of advantages to be had with a life in the tropics appeals to him let him first acquire through at least two years of experience on well organized works in the States, as much knowledge as possible of organization and of economical and expeditious methods of execution, since these can hardly be acquired in those islands.

"These 'sugar islands' bid fair to offer a fine field for specialists in at least two lines of engineering and also in a third line, which, while not strictly engineering, will be invaded by technically educated men. First of these in order of development is the construction and maintenance of public highways, under tropical conditions and both in low lands and mountains. Porto Rico, with an area of about 3,600 square miles and 950,000 population will require 600 to 700 miles of macadamized roads, of which only about 250 miles are finished. Six millions dollars will be required to complete them and thereafter about $500,000 annually for maintenance.

"The Hawaiian group has an area of about 7,500 square miles (about double that of Porto Rico), and the Philippines about 80,000 square miles (or about 22 times that of Porto Rico). Cuba has an area of over 43,000 square miles (about 12 times that of Porto Rico). The development of the public highway systems in all these islands will require the building of some 20,000 or 30,000 miles of improved road, at a cost of somewhere between $200,000,000 and $400,000,000 and will entail an annual maintenance charge of something between $10,000,000 and $15,000,000. The financial difficulty of this development is alone sufficient to extend its execution over many years—probably 50 or 60, and very likely 100 years or more.

"I will not go into the question of railroad construction in the American Islands because it is not a great factor in Porto Rico or Hawaii—although both will build a small mileage—and in the Philippines the railroad era has yet to come and the probable mileage that will be required, in say the next 50 years, cannot be estimated from this distance. No doubt Cuba and the Philippines will afford some considerable opportunities in this line.

"The other element of the transportation problem in these islands is 'Harbor Improvements.' Harbor works of considerable magnitude are now under contract at Manila. They are being executed under the Civil Government. The three or four harbors of Porto Rico that should be improved will require an expenditure of five or six million dollars. No moneys have yet been appropriated for this work. But corporations are ready to spend several hundred thousand dollars in the construction of piers.

"The second line of engineering in which a field is open for specialists or experts is that of sugar making. It will appeal to many as the most interesting of the two because a modern central sugar factory, in its construction and operation, requires the solution of problems in transportation, structural work, intricate machinery, power plants, thermodynamics and chemistry. Cuba, Porto Rico and Hawaii are essentially sugar islands and the Philippines already producing considerable sugar, will greatly develop this industry. It will be admitted that the total investment in sugar for all these islands will, in a few years, reach a figure between $400,000,000 and $500,000,000. This will be distributed around perhaps 150 central factories, every one of which should have an engineer in charge as Superintendent. The construction of these factories, with their incidental plantation roads and irrigation works, will furnish employment for a number of engineers.

"The third field referred to as offering inducements for specialization of technical men is closely allied to sugar manufacture, and may often be combined with it. It is the management of cane plantations, including the cultivation of the cane, irrigation, building and improving the plantation roads, and improving the methods of transporting the cane from the fields to the central factory. This work offers more of a field for real engineering and applied science than will appear at first thought to one not familiar with this industry. The cutting of from 100,000 to 200,000 tons of cane and transporting it to the factory, an average distance of perhaps two to four miles, is a problem of sufficient importance to make it interesting. Then this entire acreage has to be deeply plowed every four to ten years. The plowing of 1,000 acres a year is no boy's play—it used to be farmers' work, but now engineers are doing it by steam. The steam plowing apparatus is now successfully used but is by no means perfected. It is a profitable direction in which to apply ingenuity.

"Then there are the irrigation problems, always interesting and last but not least in scientific interest, the improvement of the cane by cultivation and the development of improved varieties. The introduction of new and improved varieties of sugar cane is of comparatively recent date and efforts in this line promise high reward.

"The subject of water power development is one of great importance to Porto Rico, and probably also to the others of these islands. Steam coal costs, delivered at a port in Porto Rico, schooner load, from $7 to $8 per ton, which is from two to four times its average cost in many of the States. Therefore, a water power is much more valuable per unit of power than it would be here. There is no trouble from ice there, and ample opportunity for storage is afforded by the deep mountain gorges. A number of the rivers have a very fair low water or minimum flow which can be increased by empounding the waters of the rainy season. Some ideal sites exist in the rocky mountain gorges for high masonry dams. The rivers have, often, an average fall of 50 ft. to the mile for 10 to 20 miles, and in many places 100 ft. or over within one mile. From 10 to 25 miles will cover the range of distances to which the current would have to be transmitted. I presume that in Cuba and Luzon the current might sometimes have to be transmitted much longer distances, but with practical, commercial, transmission already carried up to 90 miles, and no sign that the limit is yet reached, this extending radius should increase the number of water powers that can profitably be developed all over the world, directly as the square of twice the radius, multiplied by some empirical constant to account for those points or centers of consumption or use which have heretofore gone to the water power, and for other factors."

TECHNICAL.

Manufacturing and Business.

C. H. Wilmerding, Consulting Engineer, Chicago, has removed his offices from the Fisher Building to 1300 "The Temple."

F. M. Pease & Co., Chicago, have recently received orders for 42 tank cars, 50 box cars, 27 flat cars, two passenger coaches and three locomotives from different parties.

The National Brake Co. has been incorporated in Missouri, with an authorized capital of $600,000, $400,000 of which will be common and $200,000 preferred. The incorporators are: James F. Leighton, Wm. H. Scott and Oscar P. Condon.

John H. Allen has been appointed Manager of the Chicago offices of the Standard Railway Equipment Co., with offices at 707 Great Northern Building. Mr. H. V. Kuhlman, whom Mr. Allen succeeds, has resigned to engage in other business.

The O. M. Edwards Co., Syracuse, N. Y., manufacturer of the Edwards window fixture and vestibule platform trap door and other railroad devices, has established an office and show room at 501 Fisher Bldg., Chicago. It will be in charge of E. E. Silk, as Western Manager.

The Bemis Car Truck Co. has been incorporated under the laws of New Jersey, with a capital of $300,000. The principal office is at 765 Broad street, Newark, N. J. The incorporators are: Winfield S. Dehart, Bloomfield, N. J.; Geo. B. Hewlett, New York City, and Joseph D. Gallagher, Glen Ridge, N. J.

The Hicks Locomotive & Car Works has sold a private car to the Fort Smith & Western R. R. The interior finish is mahogany, the general scheme of decoration is green, and the upholstery is dark olive plush. The arrangement comprises two staterooms and four double berths in the observation and one in the dining end.

Carl A. Bostrom, of The Osborn Engineering Co., Cleveland, Ohio, has been awarded the Macdonald prize of the net annual income of the invested fund of $2,000 for the best thesis of the class of 1901, at the Rensselaer Polytechnic Institute. The title of the thesis was, "Design for the Development of the Water Power of the Potomac River at Great Falls, Md., for Electrical Transmission to Washington, D. C." The prize is offered by Charles Macdonald of the class of '57.

James A. Gordy, formerly Terminal Freight Agent for the D., L. & W. R. R., with office at the foot of Cortlandt street, New York City, has been appointed Traffic Manager for the H. W. Johns Asbestos Mfg. Co., with offices at 100 William street, New York City. Mr. Gordy is about 40 years old. His first railroad service was with the Erie Railroad as telegraph operator on the Eastern Division. From there he went to the Pennsylvania as Freight Agent for several years. He was also Terminal Freight Agent for the West Shore for about eight years.

The Sargent Co., of Chicago, heretofore operating an open-hearth steel plant at Fifty-ninth street in that city to make draw-bars, knuckles, coupler parts for repairs, and a plant at Chicago Heights to make Tropenas steel castings and steel and iron brake-shoes, has sold its plant at Chicago Heights, to the American Brake Shoe & Foundry Co. The Sargent Co. will, however, continue operating the open-hearth steel plant at Fifty-ninth street, where its general offices will be located. The company is having plans and specifications made for an extension which will give it approximately three times the capacity of its present plant.

An unusual number of orders is reported by the Garry Iron & Steel Company, Cleveland, Ohio. All departments are busy, some 450 men being employed. The orders are for iron and steel buildings and roof trusses for new shops and factories. The Garry revolving pneumatic crane is also being largely sold, both at home and abroad. One of these cranes was shipped this week to the McPherson Switch & Frog Co., at Niagara Falls, N. Y. C. S. Bigsby has been appointed Sales Manager of the Garry Company, the other officers being: President and Treasurer, B. F. Powers; Vice-President, G. E. Needham; Secretary, E. C. Powers; General Superintendent, C. A. Boyd, and Purchasing Agent, J. G. Steinley.

Iron and Steel.

The Pennsylvania & Ohio Bridge Co., of Conneaut, Ohio, has been incorporated in that State with $170,000 capital.

The Sheffield Rolling Mill Co. is reported to have bought $100,000 worth of steel billets for use at the works at Sheffield, Ala.

According to Harrisburg (Pa.) despatches, the Central Iron & Steel Company has decided to build four additional large open-hearth furnaces.

The International Railway Specialty Co. has been incorporated in Maryland by Holliday H. Burkhart, Henry E. Boyd, Charles H. Boulden and others.

The American Bridge Co. has a contract for three deck plate girder spans for a bridge at Streator, Ill., for the Chicago & Alton. The contract for the substructure is not let.

According to Pittsburgh despatches the American Steel Co. expects to secure a Pennsylvania charter this week. It will be capitalized, probably, at $1,000,000. E. S. Reilly is President.

Samuel G. Moffitt has resigned the superintendency of the open-hearth plant of the National Steel Company at Sharon and will take charge of the new works of the La Belle Steel Company at Steubenville.

It is reported that bids are being requested by John Price, Consulting Engineer, Birmingham, England, for a steel bridge, etc., of six spans, 64 ft., 69 ft., 100 ft., 120 ft., 145 ft. and 64 ft., weighing 1,500 tons.

Frank Conger, formerly Vice-President of the American Bridge Company, died at Detroit, Mich., March 8. He was born in Groton, N. Y., in 1849 and was President of the Groton Bridge & Manufacturing Co., at Groton, N. Y., until its absorption by the American Bridge Co.

The following are the estimates of the cost of improvements proposed to be made by the United States Steel Corporation in Pittsburgh, work on which has either been or will be begun during the present year: Armor plate mills, $3,000,000; Bessemer Railroad, $1,000,000; structural mill at Homestead, $750,000; American Bridge plant (new), $1,500,000; Neville Island furnace plant, $1,500,000; other improvements, $250,000; total, $8,000,000.

Oil Fuel on the Rock Island.

It is said that development of the oil fields in the Wichita mountains near Granite, Okla. T., will soon result in extensive use of oil for fuel on Rock Island locomotives. The oil found near Granite has been tested in the laboratory of the Rock Island and is reported to contain 73.64 per cent. of available fuel as against 50 per cent. reported for Beaumont oil. The same press report from which this is taken says that satisfactory experiments have been made in lubricating journals with the crude Oklahoma oil, and that Prof. Edson, of Chicago, a noted geological expert, who spent 10 days in examining the country about Granite reports that in his opinion an inexhaustible lake of oil is underneath the surface in that locality.

Efficiency of Hydraulic Rams.

The April issue of the Stevens Institute *Indicator* will contain an article by A. J. Wood, on "Determination of the Efficiency of Hydraulic Rams." The writer says he has sought to point out that D'Aubuisson's formula, which has been approved by many for over half a century, appearing and reappearing in some text-books and in many printed discussions, is fundamentally wrong as applied to the single-acting hydraulic ram, and that Rankine's formula, under severe tests in practical problems and under a wide range of conditions is found to be consistent.

The Bonzano Joint.

The Bonzano rail joint is now in use on the following railroads: Pennsylvania Railroad; Burlington, Cedar

Rapids & Northern; Baltimore & Ohio; Chicago & Eastern Illinois; Canadian Pacific; Chicago & Alton; Cuba Railway; Duluth & Iron Range; Lake Superior Power Co.; Lehigh Valley; Louisville & Nashville; Michigan Central; Pittsburgh & Lake Erie; Galveston, Harrisburg & San Antonio; Southern Railway; Southern Railway of Arizona; Toledo, St. Louis & Western; West Virginia Central & Pittsburgh; Wisconsin Central; and the Western Oklahoma.

The Holman Railroad Tracklayer.

The D. F. Holman Railway Tracklayer Co., Chicago, has recently been incorporated to build the tracklaying apparatus covered by the patents of the late D. F. Holman. A circular issued by the company describes this apparatus as consisting of a series of tramways 30 ft. long and 20 in. wide, fitted with heavy iron rollers. These tramways are attached to the sides of ordinary flat cars by adjustable iron stakes that fit into the stake-pockets, and being connected they operate as one continuous tramway along a train of several cars. The ties and rails are thrown upon these tramways and are carried to the front, where they are received by men and placed in position on the roadbed. The rails come down one side and the ties on the other. On the tie side a chute, supported by a wire cable, runs out 35 ft. in front of the train, which allows the tie-gang to be one panel ahead of the rail-gang. A train of 10 cars—six cars of ties, three of rails, and a tool car—will carry sufficient material for a half-day's work, equivalent to one-half to three-quarters of a mile of track. It is claimed that a capable foreman, with 40 men, can lay one and a half miles of track per day with this apparatus, if the material is properly delivered by the railroad company. This includes full tieing, laying the rails in position, joint, quarter and center spiking, and putting on the fish plates or angle bars, with two bolts through them. The makers claim that from $50 to $200 a mile can be saved by the use of this appliance, and that 10,000 miles of track have been laid by it since 1880.

THE SCRAP HEAP.

Notes.

The City Council of Fort Worth, Texas, has passed an ordinance forbidding, under penalties of $25 to $100, the sale by brokers of non-transferable tickets.

The Delaware, Lackawanna & Western has promised to give $10,000 toward the erection of a building for the Young Men's Christian Association at Scranton.

According to the Lincoln (Neb.) *News*, all the freight conductors on the Burlington road will hereafter make duplicate copies of their lists of cars, by means of carbon sheets, thus avoiding many chances of error.

The Atchison, Topeka & Santa Fe is going to use quadruplex apparatus on its telegraph lines at its principal offices; that is to say, for business to and from Chicago, Topeka, Purcell, Galveston, La Junta, Las Vegas, Flagstaff and Los Angeles.

The State Board of Health of Pennsylvania has adopted a resolution requiring all cars in passenger trains to be supplied with cuspidors; smoking cars to have one for each seat and other cars to have one at each end of the car. It does not appear that the Board has yet promulgated this resolution in the shape of an order, or, indeed, that it certainly has the power to do so.

Press despatches from Boston, March 10 and 11, report an extensive strike of freight handlers in the freight houses of the New York, New Haven & Hartford and the Boston & Albany railroads, in consequence of the discharge of seven men by the former road for refusing to handle freight delivered at the freight houses by the Brine Transportation Co., a large teaming concern. A strike by the employees of the Brine Company had been quelled and the strike of the railroad men was started in sympathy with the defeated teamsters. On Tuesday, it was reported that 16,000 men had stopped work. This number apparently included large numbers of longshoremen, teamsters and others not railroad employees.

Crossing Lake Baikal in Winter.

Under date of Feb. 1, 1902, Consul-General Holloway writes from St. Petersburg: "The difficulties encountered in crossing Lake Baikal in winter are shown by a statement that the Trans-Siberian express, which reached Myssovaya, one of the termini of the lake passage, on Jan. 5, was detained at that place for six days. The passengers were finally compelled to cross the frozen surface, a distance of upward of 30 miles, in open sleighs and on horseback, with the thermometer registering 27 deg. below zero. The ice breakers are useless against the dense mass of ice, which, owing to high winds, overlaps and packs, making the surface extremely rough and almost impassable. It is not expected that the railroad around the lake will be completed under two years."

Losses and Damages in France.

The French Minister of Public Works has been investigating the payments by the railroad companies for loss, damage and delays of passengers and freight in transit and for thefts; and he reports these have been increasing in an alarming manner. In 1885 they were less than 5,000,000 francs, in 1895 over 7,500,000, in 1898 8,500,000, and in 1900 no less than 17,000,000 francs.

The Upper Congo Railroad.

The new railroads to be built in the Congo Free State to connect the head of navigation of the Congo at Stanleyville with Lakes Albert Nyanza and Tanganyika, are to be of meter gage, while the original Congo Railroad is of 75 centimeters (nearly 30 in.) gage. As they are separated by more than a thousand miles of river navigation the break of gage is unimportant; but it is significant that the existing road has not been found satisfactory. Moreover, the new lines are to have heavier rails (50 lbs. per yard) and steel ties, calculated to carry 30-ton locomotives and cars carrying 10 tons. The chief of the new lines will be one from Stanleyville east by north to the north end of Lake Albert at Mahagi, another also from Stanleyville up the river past the rapids to an upper navigable stretch of the Congo, and a third from Loango, on this stretch, to Albertville on Lake Tanganyika, perhaps 500 miles south of the Lake Albert line.

Austrian Freight Rates.

A number of manufacturers and other shippers of freight have petitioned the Austrian government against a rumored advance in the freight rates of the State Railroads. Such a policy, they say, would cause them to curse the day when the State acquired railroads, a policy which they have generally favored heretofore, and which many of them have asked to have extended soon, so as to absorb leading private railroads. The fact is that the State Railroads do not earn the interest on their cost, and they come into the possession of the State largely for that reason. It is attempted to maintain on them rates at least as low as those of the profitable private railroads, with the result that the shipper is relieved at the expense of the tax-payer.

The Speed of a Balloon.

The balloon which left Berlin Feb. 1, at 9:30 a.m., and was wrecked at Antwerp at 2:43 p.m., the same day (the balloonist losing his life), appears to have gone at a greater speed than man ever traveled before. Observations of it were made at several points on the route, and, according to these, it traveled from Hildesheim to Wesel, 153 miles, in 55 minutes, and made the whole journey at an average speed of 77 miles an hour, and the last 276 miles at 118 miles an hour.

Railroad Employees in Germany.

The number of employees of all kinds on the railroads of the whole German Empire in 1900 was 537,122, which was at the rate of 17.3 per mile of road, and one to every 105 inhabitants. The total number is 63,000 less than that of the active army.

Ontario Ship Railway.

This company, which has had a charter for 10 years to build a ship transport line from Georgian Bay to Lake Ontario, has received one more chance from the Provincial Legislature, under a new bill. In accordance with this the company must spend $50,000 the first year and complete its work in three years. The headquarters of the organization are at Toronto and it is said that it is intended to push the work through at once.

Tunnel for Power Plant.

An important engineering work is to be undertaken at once near Vancouver, B. C. It is proposed to build a tunnel 2½ miles long through a mountain to pass a large water pipe. This is to be run from Lake Beautiful, 2,500 ft. above the sea level, to the head of Coquitlam River, with the object of providing a large water power plant to supply electricity to Vancouver and Westminster. The Coquitlam River is too small a stream to supply by itself the necessary power, so that the proposed tunnel is necessary. The present outlet of the lake runs in exactly the opposite direction from that of the proposed tunnel, which will be 3 x 8 ft. The estimated cost of the work is $350,000.

A Manufactured-Fuel Plant.

The Colorado Fuel & Iron Co. have practically completed work on a briquette plant at Gallup, N. Mex. The invention is new, although it has been experimented with, in a small way, for some time, and the company admit that they do not as yet know how to secure the best results and are still experimenting. The present plant is a small one, built chiefly for experimental purposes and, if successful, it is planned to build a similar one in that locality to cost $500,000. The object of the process is to utilize the slack coal that is screened at the mines, and it is claimed that the by-products of carbon, gas, ammonia and a small amount of benzine will pay for the cost of operation. The briquette will be 3-in. cubes and the present plant is capable of reducing about 400 tons of slack to briquettes each day.

The Baggage Pad.

"Baggage must be trucked and not rolled, and in unloading it from a truck a pad must be used." Ten years ago you would have gone a long way to find such a rule in a baggage room, but this legend in bold type now stares at the truckmen employed at the Union Station in Omaha. The "pad" is a huge stuffed floor mat, which the truckmen call a "feather bed." It is very long and very wide and is stuffed solidly with hair and covered with three thicknesses of the heaviest canvas ducking. There is absolutely no deviation from the rule. Indeed, the sound of a trunk falling upon the floor is as good as the gong that sounds the discharge of the man handling it. As a result of this strictness the pads are used so assiduously that they are worn out in a short time. But the clause which provides that baggage shall be trucked, not rolled, is a big feature. The difference in the wear and tear on a trunk when it is zig-zagged bumpety-bump 20 or 40 yards over wood and stone and when it is hauled the same distance on a wheeled truck can be readily understood.

There is another modern rule; one that "baggage in bad order should be repaired promptly and held for that purpose when necessary, if for outgoing trains." But the betterment of the baggage service has been more strikingly shown in the details of the work than in its delicacies. Nor is baggage lost any more, even temporarily, save on rare occasions, when it is usually traced and found. Every man in the room has his specified duties. There are truckmen, checkmen, mailmen, and baggagemen, all so designated on their caps.

Almost entire immunity from loss results from the adoption of a new system of checking which has been gradually introduced for some two years past on the Western railroads. The old brass checks are being abolished as rapidly as possible for paper ones. The brass checks carried merely the name of the railroad and the check number. A complete record of the property is now kept [with consecutively numbered checks]. The subdivision of the different styles of baggage is one secret of the new scheme and its success.

The number of pieces of luggage shipped in and out of Omaha in a year forms an astonishing total. Just now it is the dull season, but at the Union Station they are handling over 800 pieces every day, at Burlington Station about 400 and at Webster Street Station 200. In 1901 there were 357,000 pieces handled at the Union Station, 141,862 at Burlington Station, and about 75,000 pieces at Webster street. And 25 men do all this work the year around. There are 12 at Union Station, nine at Burlington Station and four at Webster street. These employees work split tricks, because the business comes in fits and starts during the day. Excess baggage is a big feature of the business. A large percentage of the trunks are overweight. At Union Station $200 a day excess money is a fair average, and at Burlington station it runs over $10,000 a year. The Omaha stations have cashiers in their baggage rooms; formerly the ticket agents did this.—*Omaha (Neb.) Bee.*

A Chance for the Steam Motor Car Man.

The Society of German Mechanical Engineers has offered first, second and third prizes of 5,000, 3,000 and 2,000 marks, respectively, for the best design for a steam locomotive, with a single car carrying 100 passengers and their baggage, to run 75 miles an hour on a straight and level track. The intention is to develop a system of frequent service between the large German cities.—*Press Cable.*

Telephones on the Illinois Central.

Experiments, having in view the adoption, to a greater or less extent, of telephones for the transaction of some of the business now done by the telegraph, are being conducted by the Illinois Central, and the results so far have been quite satisfactory. The greatest distance over which tests have been made up to the present time is 407 miles, between Chicago and Fulton, Ky. A special transmitter, made by Knowles & Tillman, of Buffalo, N. Y., and having a double diaphragm, is used. The only change made in the long-distance receiver is to render it less sensitive by the use of a heavier diaphragm, which reduces the inductive effect. The metallic circuit necessary for this long-distance service is obtained by connecting the telephones across the Memphis and the New Orleans wires, which diverge at Fulton, and the latter point is therefore the greatest distance to which communication can be made at the present time. By bridging the telegraph stations and introducing condensers, there is no interference with telegraphic transmission. During the experiments these stations are cut out in order to obtain an unbroken circuit. The extent of the adoption of the telephone by the Illinois Central depends upon the success of these experiments. Nothing in the way of telephoning from trains has yet been attempted, though it is the intention to try this later.

Railroad Supplies for Nicaragua.

Consul Donaldson writes that the Nicaraguan Government has signed a contract (dated Dec. 15 last) with Mr. P. W. Chamberlain, an American engineer, to buy 300 tons of rails and other fittings for the Atlantic Railroad, which the latter is building. It is stipulated in the contract that the above-mentioned material is to be purchased in the United States. The consul adds that Mr. Chamberlain is at present pushing to completion the work on that part of the road connecting the Indio River with the San Juan River at San Francisco, from which point there is steamboat navigation.

Compressed Air Company.

At the annual meeting of the Compressed Air Co., held in New York, March 10, the following officers and directors were elected: Directors, H. D. Cooke, N. C. Knight, A. C. Soper, H. Monkhouse, Thomas B. Kent, C. S. Truax, D. C. Moorehead, A. B. Croal and C. H. Duell. Officers—President, H. D. Cooke; Vice-President, H. Monkhouse; Secretary and Treasurer, H. A. Himely. President H. D. Cooke, in his annual report, said: "The earnings of the Rome Locomotive & Machine Works are more than sufficient to pay the operating expenses of the Compressed Air Company, including interest charges on all the obligations of both companies. The present earnings of the Rome Locomotive & Machine Works are about $4,000 net a month, and it is believed that the expenditure of an additional $50,000 would largely increase the output, and by furnishing improved facilities materially increase the ratio of profits. To provide working capital the Compressed Air Company offers to its stockholders the right to subscribe to additional amounts of its 20-year 5 per cent. gold bonds. There is now outstanding $105,000 bonds of the Rome Locomotive Works and $305,000 out of a total issue of $500,000 first mortgage 5 per cent. bonds of the Compressed Air Company. Of the remaining $195,000 of the latter issue in the treasury, $50,000 are offered to the stockholders of the Compressed Air Company at $88.40 and interest. The subscriptions will be closed March 25."

A Monument to Baldwin.

A monument to the memory of Matthias W. Baldwin is to be erected in Philadelphia. Mr. Converse has said that while the plan is not yet complete, it will be carried out within a reasonable time. The site has not been decided on.

Fifteen Killed in Train Wreck at Maxon, Texas.

Westbound passenger train No. 9, of the Southern Pacific, was derailed near Maxon, Texas, 25 miles west of Sanderson, on the morning of March 7, about 3 o'clock, and 12 passengers and three trainmen were killed. The wreck at once took fire from the engine and the whole train, except one private car, was burnt up. About 30 persons were injured. The newspaper reports say that the train was running at high speed and that it was thrown off the track by the breaking of a rail; but an officer of the road says that the speed was moderate and that the conductor thinks that the derailment must have been due to an obstruction on the track. The train consisted of an engine, mail car, baggage car, one coach, one chair car, three tourist sleepers, one Pullman sleeper, and one private car. It was when rounding a curve that the train left the track. Nearly all the passengers were asleep, and the shock that followed was the first intimation they had of their danger. The tender and engine landed in the ditch and the foremost cars piled up against the engine and caught fire. It was impossible to move any of the coaches or tourist cars, as they were off the rails, and they were soon consumed by the flames. It is said that the bodies of the killed were burnt up.

Railroad Organization.

The January issue of the *Journal of the Association of Engineering Societies* contains an article of 32 pages on railroad organization. It is written by Mr. George T. Sampson, Division Engineer, New York, New Haven & Hartford Railroad. We have not had time to do more than glance at the article; but it appears to be a pretty careful study of this important and interesting subject. The *Journal* may be had from Mr. John C. Trautwine, Jr., Secretary of the Association, 257 South Fourth street, Philadelphia, Pa., and the price of single numbers is 30 cents.

The Cape Cod Canal.

The Boston, Cape Cod and New York Canal Company has not, as has been reported, advertised for bids for the construction of the canal, but it has, it is understood, asked for bids for the construction of jetties at the en

trance to the canal in Barnstable Bay. The plans for these jetties were approved not long ago by the State Harbor and Land Commissioners, and the work to be done in constructing them is assumed to be outside the work of constructing the canal proper, which has to be done under the supervision of a joint board composed of the members of the railroad and harbor and land commissioners. The Harbor Board received a petition from the company some months ago to issue a license; but it refused to approve the issue of stock and bonds as petitioned for. The whole matter, therefore, rests where it has been for the last eight months. It is assumed that no large expense will be incurred in the building of the breakwater until the company is ready to proceed on some portion of the canal itself.

Technical Schools.

Purdue.—Mr. C. H. Vannier, of the Griffin Wheel Company, Chicago, delivered an address before the Engineering students of Purdue University upon "Cast-Iron Car Wheels," on Wednesday, the 5th.

Massachusetts Institute of Technology.—The Washington Alumni Association of the Massachusetts Institute of Technology, at an informal meeting held at Washington last week and attended by about 25 members, heard an address on the proposed Isthmian Canal by Mr. A. P. Davis, Chief Hydrographer of the Isthmian Canal Commission. Mr. Davis discussed the various methods, proposed and now used, for crossing the Isthmus, and his address was illustrated by stereopticon maps and views of the country.

Cornell University.—Mr. Theodore Voorhees, First Vice-President of the Reading Railroad, lectured before the College of Civil Engineering on March 7. His subject was "The Relation of Engineers to Railroads and the Organization of Railroads."

LOCOMOTIVE BUILDING.

The Geisler Mfg. Co. is having a locomotive built at the Baldwin Works.

The Terre Haute & Indianapolis is having five locomotives built at the Baldwin Works.

The Mexican National is having 10 locomotives built at the Brooks Works of the American Locomotive Co.

The Wisconsin Central order for locomotives, placed with the American Locomotive Co., mentioned in our issue of Feb. 28, calls for 10 simple Chautauqua locomotives; weight on drivers, 86,000 lbs.; total weight, 154,000 lbs.; diameter of cylinders, 20 in.; stroke of piston, 26 in.; diameter of drivers, 77 in.; radial-stayed wagon top boilers; working steam pressure, 200 lbs.; 306 tubes, 2 in. in diam., outside measurement; 15 ft. 6 in. long; fire-box, 96 in. long; 74 in. wide; tank capacity, 5,000 gals. of water and 12 tons of coal.

The Iowa Central has placed an order with the American Locomotive Co., Schenectady Works, for six mogul locomotives in addition to the six moguls recently placed. Specifications call for 4 ft. 8½ in. gage, simple consolidation; weight on drivers, 150,000 lbs.; total weight, 168,000 lbs.; diameter of cylinders, 22 in.; stroke of piston, 26 in.; diameter of drivers, 55 in.; extended wagon top boilers; working steam pressure, 200 lbs.; 320 iron tubes, 2 in. in diam., 14 ft. long; fire-box, 120 in. long, 41½ in. wide, to be made of Otis steel; tank capacity, 6,000 gals. of water and 8 tons of coal; Westinghouse air-brakes; hammered iron axles; Streeter steel back brake-shoes; standard couplers; Wabash headlights; U. S. piston rod and valve packings; Ashton safety valves; Leach sanding devices; Nathan sight-feed lubricators; Scott springs; standard driving wheel tires; Boies standard truck wheel tire; cast tender wheel tires and steel wheel centers.

The St. Louis Southwestern order with the Rogers Locomotive Works, mentioned in our issue of Feb. 28, calls for the following locomotives: 20 mogul freight, 6 8-wheel passenger and 5 6-wheel switchers. The moguls are for June and July delivery; weight on drivers, 120,000 lbs.; total weight, 136,000 lbs.; diameter of cylinders, 19 in.; stroke of piston, 26 in.; diameter of drivers, 54 in.; extended wagon top boilers; working steam pressure, 200 lbs.; 290 charcoal iron tubes, 2 in. in diam., 12 ft. long; fire-box, 106 in. long, inside measurement; 39 in. wide; steel material; tank capacity, 5,500 gals. of water and 12 tons of coal. Passenger engines will weigh 82,000 lbs. on the drivers; total weight, 121,000 lbs.; diameter of cylinders, 18 in.; stroke of piston, 26 in.; drivers, 62 in.; extended wagon top boilers; working steam pressure, 200 lbs.; 275 charcoal iron tubes, 2 in. in diam., 11 ft. 2 in. long; steel fire-boxes, 108 in. long, inside measurement; 33 in. wide; tank capacity, 4,500 gals. of water and 8 tons of coal. The switch engines will weigh 100,000 lbs.; diameter of cylinders, 18 in.; stroke of piston, 24 in.; diameter of drivers, 44 in.; extended wagon top boilers; working steam pressure, 200 lbs.; 200 charcoal iron tubes, 2 in. in diam. and 11 ft. long; steel fire-boxes, 84 in. long, inside measurement; 33 in. wide; tank capacity, 4,000 gals. of water and 6 tons of coal.

CAR BUILDING.

The Northern Pacific is having 10 coaches built by the Pullman Co.

The Pennsylvania Co. is having 27 coaches built by the Pullman Co.

The Terre Haute & Indianapolis is having four coaches built by the Pullman Co.

H. J. Heinz & Co. are having 10 freight cars built at the Middletown Car Works.

The Rutland has placed an order with the Laconia Car Works for 300 freight cars.

The Westmoreland Coal Co. is having 80 freight cars built at the Pressed Steel Works.

The Pittsburgh & Lake Erie has ordered six coaches from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific order, mentioned Feb. 28, includes 1,000 box and 500 coal cars.

The St. Louis Southwestern has ordered 2,000 freight cars from the American Car & Foundry Co.

George Gould is having a private car built at the St. Charles Works of the American Car & Foundry Co.

The Dolese & Shepard Co., of Chicago, has ordered 50 gondolas of 100,000 lbs. capacity from the Illinois Car & Equipment Co.

The American Equipment Co. is having 10 freight cars built at the Indianapolis Works of the American Car & Foundry Co.

The Wabash has placed an order for 50 convertible ballast and flat-bottom gondola cars with the Rodger Ballast Car Co. for June delivery.

The Cleveland, Cincinnati, Chicago & St. Louis order, mentioned in our issue of Feb. 28, for 1,000 freight cars has been given to the Pullman Co.

The St. Louis & San Francisco has ordered 300 box, 200 coal and 60 flat cars, 25 cabooses, 12 baggage cars, 15 coaches and five chair cars from the American Car & Foundry Co.

Von Echa & Co. have ordered the following cars from the American Car & Foundry Co., for export: Two first-class coaches, two baggage cars, four third-class coaches, two cabooses, 20 box cars, six flat cars with tool racks, 12 flat cars and six stock cars.

The Michigan Alkali Co. has ordered 20 hopper bottom gondolas of 100,000 lbs. capacity from the Pressed Steel Car Co. Weight, 39,000 lbs.; length, 31 ft. 6 in.; height, 10 ft.; metal underframes, Westinghouse brakes, Chicago couplers, twin screw draft rigging and steel diamond trucks.

The St. Louis, Kansas City & Colorado has ordered two combination express and baggage, two combination mail and baggage and four coaches from the Pullman Co., and four combination baggage and express cars, four combination passenger and mail cars, four first-class coaches and four second-class coaches from the American Car & Foundry Co.

The Southern Pacific order with the American Car & Foundry Co., mentioned in our issue of Feb. 7, calls for 1,000 40-ton flat and 1,600 40-ton box cars, 1902 delivery. The box cars will be 36 ft. long; 8 ft. 6 in. wide; 7 ft. 8¼ in. wide, all inside measurements; wooden underframes. The flat cars will be 36 ft. long; 9 ft. wide, and also wooden underframes. Special equipment for both includes steel axles, cast-steel bolsters; Metal Co. pattern brake-beams; cast-iron brake-shoes for box cars and Gray iron brake-shoes for flat cars. Both flat and box cars are to be equipped with New York air-brakes; Lone Star couplers; and Miner draft riggings. Box car roofs are to be improved Winslow steel carlines.

The Texas Pacific order for 2,500 box cars with the American Car & Foundry Co., mentioned in our issue of Dec. 20, calls for the following: They will be of 60,000 lbs. capacity, weight of cars 32,000 lbs.; 34 ft. long, 8 ft. 2½ in. wide; 6 ft. 11½ in. high inside measurement; wooden underframes; Block-Pollak wrought iron axles; American Steel Foundry Co.'s bolsters; Damascus brake-beams; Gray iron brake-shoes; Westinghouse brakes; Garrett St. Louis brasses; Tower couplers; St. Louis flush door fastenings and doors; Saling metal draft riggings; Gray iron journal boxes; Fletcher lids; Patterson Sargent paint; inside Murphy roofs; French springs; American rigid steel trucks and cast-iron wheels.

The Wheeling & Lake Erie order with the American Car & Foundry Co., mentioned in our issue of Feb. 21, calls for the following: 500 box cars of 60,000 lbs. capacity; dimensions inside measurement, 36 ft. long; 8 ft. 6 in. wide; 8 ft. high; wooden underframes; Carnegie Steel Co.'s axles; Simplex and Common Sense bolsters; Sterlingworth brake-beams; Gray iron brake-shoes; Westinghouse brakes; Universal brasses; Gould couplers; Dunham doors; Wabash standard draft riggings; Wabash standard wooden dust guards; Gray iron journal boxes; Pressed steel lids; A. C. & F. Co.'s standard paint; Hutchins three-ply plastic roofs; Charles Scott springs; Wabash standard diamond trucks and American Car & Foundry Co.'s 600-lb. wheels.

The Iowa Central has ordered 400 box cars from the Illinois Car & Equipment Co. These cars are 36 ft. 10½ in. long, 9 ft. 1⅞ in. wide, 7 ft. 8¾ in. high; also 100 coal cars, which are 38 ft. 8 in. long, 8 ft. 8⅞ in. wide, and 4 ft. 1 in. high. The special equipment for both box and coal cars includes iron axles, Simplex bolsters, Streeter brake-shoes, Westinghouse air-brakes, Fulton Iron Works brasses, Standard steel couplers, Harrison dust guards, McCord journal boxes, Scott springs, Barber trucks, Griffin wheels. The box cars are equipped with Security outside doors and Chicago grain doors, Winslow roofs and Butler tandem draft rigging. The order of six passenger cars, reported in our issue of Jan. 31, was placed with the Pullman Co.

OTHER STRUCTURES.

ANNISTON, ALA.—The Southern Car & Foundry Co. will begin work at once, according to report, on its proposed malleable iron foundry here.

BIRMINGHAM, ALA.—John D. Dwyer, former Superintendent of the Birmingham Rolling Mill, and others have land between Ensley and Pratt City, and it is understood will build a rolling mill. Mr. Dwyer is to be in charge.

CHICAGO, ILL.—The Grade Crossing Track Co. has made plans for a plant on the east side of the Calumet River between 118th and 120th streets, to cost about $500,000. Contracts for the buildings are said to be let. There will be 12 buildings containing a floor space of 70,000 sq. ft. There will also be an open-hearth steel department and a rolling mill. E. W. Hutchinson is Secretary and Superintendent.

COATESVILLE, PA.—Worth Bros. Steel & Iron Co. has let contracts for four additional open-hearth furnaces with a capacity of 50 tons each. This will increase the open-hearth capacity of this plant fully 400 tons per day. A new open-hearth building will be built for these furnaces. The building will be equipped with all the latest labor-saving devices, including several traveling cranes operating the entire length of the building.

ENSLEY, ALA.—The Southern Rolling Mill Co. was recently incorporated with a paid-in capital of $60,000. W. B. Catchings & Co., 68 Wall street, New York City, and 1914 Morris avenue, Birmingham, Ala., are the promoters. The company will have a 10-in. guide mill, backed by a roughing mill. There will be 600-h.p. upright boilers and 900-h.p. engines.

KNOXVILLE, TENN.—The Knoxville Iron Co. has given a contract to the Virginia Bridge & Iron Co., of Roanoke, for three steel buildings, 396 x 80, 340 x 74 and 240 x 60. They are to be finished by Aug. 1.

NEW CASTLE, PA.—The New Castle Engineering Co. will increase its capital stock from $250,000 to $500,000 and will build a large addition to its plant at New Castle, which will include a boiler shop.

NILES, OHIO.—Wade Taylor and John F. Odea, of Niles, Ohio, according to report, propose to build a large plant to make sheet iron and sheet steel. As yet they have not decided on a location but are considering building at Niles.

PARIS, TENN.—According to report, the Nashville, Chattanooga & St. Louis has plans made for a new station in this city.

We are told that there is no truth in the report that the Louisville & Nashville will remove its shops from Paris to Clarksville.

PICTON, ONT.—The Central Ontario Ry. will build a new freight and passenger station here.

PITTSBURGH, PA.—The Phoenix Iron Company, of Philadelphia, has a contract for 1,200 tons of structural steel for the new freight depot of the Pennsylvania Lines at New Grant street. W. F. Trimble, of Allegheny, was awarded the contract for the remainder of the big building. The two contracts will aggregate $150,000. The structure is 150 ft. wide and 350 ft. long, and is made unusually heavy, so that locomotives and trains can be hauled into the second floor.

WAYCROSS, GA.—The Atlantic & Birmingham R. R. is letting contracts for equipment for shops at Waycross.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xix.)

New York Railroad Club.

The next meeting of the Club will be held at 8 p.m., March 20, at 349 Madison avenue, New York. Paper to be presented: "Some Principles of Railroad Regulation," to be presented by Mr. H. T. Newcomb, Editor *Railway World*. Advance copies of this paper will be issued as a supplement to the February Proceedings.

Canadian Society of Engineers.

At the annual convention, Jan. 29, the election of officers resulted as follows: President, Dr. Martin Murphy, Halifax; Vice-Presidents, G. H. Duggan, Montreal; Col. W. P. Anderson, Ottawa; Ernest Marceau, Montreal; Treasurer, H. Irwin; Secretary, Prof. C. H. McLeod; Librarian, E. A. Rhys-Roberts; Council, H. N. Ruttan, W. B. Mackenzie, K. W. Blackwell, John Kennedy, J. M. McCarthy, W. G. Matheson, R. B. Rogers, W. R. Butler, E. V. Johnson, E. A. Hoare, Willis Chipman, Charles Baillairge, Stuart Howard, Cecil B. Smith, N. J. Ker.

At the ordinary meeting on Thursday, March 13, a paper was read by Mr. C. H. Davis, on "Competition of Steam vs. Electric Parallels."

PERSONAL.

—Mr. H. H. Filley, M. Am. Soc. C. E., Consulting Engineer and Chief Engineer Mexican National Construction Company, is engaged on important work in Zamora Michoacan, Mexico.

—It has been announced unofficially that Mr. C. H. Warren, Vice-President of the Central Railroad of New Jersey, has offered his resignation to take effect June 1. Mr. Warren intends soon to take a trip abroad to be gone a month or longer.

—Mr. Henry A. LaChicotte, M. Am. Soc. C. E., has been appointed Engineer in Charge of East River Bridges Nos. 3 and 4, to succeed Mr. R. S. Buck, M. Am. Soc. C. E., who is now Principal Assistant Engineer of the Department of Bridges, City of New York.

—Mr. W. A. Haven and Mr. George A. Rickey, both of Buffalo, have been elected members of the Institute of Engineers of the Republic of Chili. This is in recognition of the courtesies shown to various foreign engineers who visited Buffalo during the Pan-American Exposition. Mr. Haven is President of the Engineers Society of Western New York, and Mr. Rickey was Chairman of the Reception Committee.

—The new Assistant General Superintendent of the Chicago & North Western, Mr. W. D. Cantillon, was born in 1861. His entire railroad experience has been with this company. For two years he was engaged on bridge work, then for four years was freight brakeman, later becoming Trainmaster, then Assistant Superintendent, which position he held for six years, and finally became Division Superintendent.

—Mr. H. E. Vautelet, who recently assumed the duties of Chief Engineer of the Canadian Pacific, was born Feb. 25, 1856. He was educated at the School of Mines, Paris, from which he was graduated about 1874. Mr. Vautelet began his railroad service in the locomotive department of the Northern Railway of France, and was in the Geological Survey of Canada from 1884 to 1885. He has been connected with the Chief Engineer's office of the Canadian Pacific since 1886.

—Mr. F. R. Pechin, who was promoted from Assistant Division Superintendent to the Superintendency of the Northern Iowa Division of the Chicago & North Western Railway, was born June 29, 1857. He entered the service of this company in 1880 as a brakeman. In 1889 he went with the Louisville Southern, but at the end of one year returned to the Chicago & North Western as conductor and discharged the duties of conductor until 1897, when he was promoted to the position of Trainmaster. The following year he became Assistant Superintendent. Mr. Pechin assumed his new duties on March 1, 1902.

—Mr. George E. Beebe of Rahway, N. J., whose death occurred Feb. 28, 1902, was born at Norwich, Conn., in 1828. Mr. Beebe's business career began when he was 15 years of age. He was an accountant of great ability and until blindness compelled his retirement from business he held positions of much responsibility. While yet a very young man he was chosen to organize and control a chain of banks in the Pennsylvania oil district. He was connected with the Wells-Fargo Express Company for several years, going from there to take charge of the accounting department of the Northern Pacific. He resigned from the position of Treasurer of this company to go with the Standard Oil Company.

—Mr. G. J. Bury, who, on Feb. 19 last, became Assistant General Superintendent of the Lake Superior Division of the Canadian Pacific, was born in 1866. Mr. Bury entered railroad service in 1882 as a clerk in the purchasing department, then served in clerical positions in different offices until 1890. In March, the same year (1890), he was made Assistant Superintendent

at North Bay, later becoming Superintendent. In 1889 he assumed the Superintendency at Fort William, which included the terminals there and the line from Fort William to Winnipeg. Mr. Bury was transferred to Cranbrook as Superintendent in 1901, from which position he resigned to assume the Assistant General Superintendency.

—Mr. Tracy Lyon, who was recently appointed Assistant General Manager of the Chicago Great Western, was born at Oswego, N. Y., in 1865. He was graduated from the Massachusetts Institute of Technology in 1885, and is a member of the American Society of Mechanical Engineers. Mr. Lyon was for several years a member of the firm of Robert Bement & Company, engineers and contractors of St. Paul. His first railroad service was with the Chicago Great Western as General Master Mechanic in 1894. He remained in this position five years, becoming General Superintendent in 1899. From this position he was promoted to that of Assistant General Manager, assuming his new duties in March, 1902. As will be seen Mr. Lyon's whole railroad career has been with this company.

—Mr. Harry R. Sanborn, Superintendent of the Minnesota & Dakota Division of the Chicago & North Western, is a native of Wisconsin, having been born at Monroe in 1862. He was educated at the Iowa State University and entered the service of the Chicago, Milwaukee & St. Paul in 1879 as a rodman and civil engineer. This position he held until 1885 when he became clerk to the Assistant General Superintendent of the Chicago & North Western. Two years later he was appointed roadmaster and in 1890 assumed the duties of Superintendent of Bridges and Buildings at Huron, S. Dak. For four years he was Assistant Superintendent and in April, 1900, became Superintendent of the Western Iowa Division, and the following year was transferred to Sioux City, Iowa, as Superintendent of the Sioux City Division, and on March 1 this year was again transferred as Superintendent of the Minnesota & Dakota Division, with headquarters at Winona, Minn.

—Mr. Thomas Ashley Bissell, a famous car builder, died Feb. 26. He was born in 1835 near Erie, Pa. Mr. Bissell entered Allegheny College with the intention of studying for the ministry, but was compelled to give up his college course. He then went West and later entered the service of the Chicago, Burlington & Quincy as a bridge builder, after which he became Chief Draftsman at Aurora, Ill. There he became known to Mr. George M. Pullman and was offered and accepted the management of the Pullman shops at Detroit, assuming the duties in 1872. Mr. Bissell remained in Detroit nine years. He laid out the shops at Pullman, and was offered the management, but decided to go with the Barney & Smith Co., at Dayton, Ohio. In 1886 he accepted the management of the Wagner car shops at Buffalo, N. Y., and built an almost entirely new plant, which is recognized as one of the best in the country. While at Buffalo Mr. Bissell made a number of inventions, including a system of platform, buffer and vestibule, which is much used. Owing to ill health he was obliged to retire in 1895. Mr. Bissell was a member of the Master Car Builders' Association, holding the Third Vice-Presidency from 1890 to 1895, and his influence on the art of passenger car building has been of the first importance.

—It is announced that Mr. Henry Fink, who for the last six years has been President of the Norfolk & Western, is to retire from that office to take the position of Chairman of the Board. Mr. Fink is now 71 years old, and this change to an office less active than the Presidency probably marks his retirement from participation in the details of the management of the road. Mr. Fink has had a remarkable career, having been in the service of various Southern railroads over 50 years. He was born in Germany, in 1831, and was educated at the Polytechnic school at Darmstadt. His railroad service was begun on the Western Maryland as rodman and transitman in 1851. He served in similar capacities on the Baltimore & Ohio, and in 1855 went to the Norfolk & Petersburg. On this road he remained in various positions for 16 years, being promoted to the position of Superintendent of Transportation. Throughout his long career Mr. Fink has been mainly with this line and its allied corporations the Atlantic, Mississippi & Ohio, the East Tennessee, Virginia & Georgia, the Norfolk & Western, etc. To recount all his various titles and promotions would fill half a column. These roads were reorganized several times, and six times Mr. Fink held the office of Receiver. In 1887 he was made one of the Vice-Presidents of the Richmond & Danville, and was connected with that road and its successor for a number of years. In 1895 he was appointed one of the Receivers of the Norfolk & Western, and since that date has devoted his time chiefly to the interest of that company.

Mr. Fink is a younger brother of the late Albert Fink. The latter became more widely known, by reason of the publication in 1875 of his original researches in the field of scientific railroad economy, both men having until that time been known mostly in the South. But the two were looked upon by their friends as a good deal alike, and to those who knew the elder but do not know the younger the latter can be described as possessing the same philosophical and analytical mind and habits of patient study, and the same kindly disposition. Mr. Fink has had an experience which is quite unusual, if not unique, in that, as he has said he "has always been with poor, broken down roads." As stated above, he has been a receiver six times. Thus, like the physician, he has come to feel more at home in surroundings of (financial) sickness and death than in circles where health and pleasure are the normal condition. The reader who is a railroad officer does not need to be reminded, in this connection, of the eternal principle that it is only through struggle that strength and wisdom are developed; for every president or manager of experience realizes that it has been in the stresses of hard times that he himself has learned most of his best lessons. To one who, like Mr. Fink, has had the task of restoring crippled properties as his constant work for many years, we are safe, therefore, in offering congratulations on the possession of an unusual measure of those qualities of judgment, foresight and firmness which best fit a man for managing either prosperous or unprosperous railroads. And at last Mr. Fink enjoys the felicity of being with one of the former kind, for the Norfolk & Western, with the chief management of which he has been connected since 1895, is now, as everybody knows, reaping the fruits of the great expenditures of money, brains and energy that have been put into it during these years. It is not in a condition where the managers can lie on their oars—those days are now past for all railroad managers—but it is getting a fair share of the increase in business, and its growing strength appears to be in every respect a healthy growth. Mr. Fink does not appear to be as old as the calendar indicates, and we judge that in relinquishing the presidency for a less active office, he is actuated largely by his love of home; his home is in New York, while the president's office is going to Philadelphia.

ELECTIONS AND APPOINTMENTS.

Addyston & Ohio River.—G. J. Long has been elected First Vice-President and A. F. Callahan becomes Second Vice-President.

Alabama Great Southern.—W. A. Weaver has been appointed Superintendent of terminals in charge of the Belt Railway of Chattanooga, with headquarters at Chattanooga, Tenn.

Arkansas Southern.—S. E. Dillon has been appointed Superintendent of Car Service, succeeding W. J. Raef, resigned.

Atchison, Topeka & Santa Fe.—D. Patterson, heretofore Assistant Master Mechanic of the Missouri Pacific, has been appointed Division Master Mechanic of the A., T. & S. F., succeeding C. M. Taylor.

Baltimore & Ohio.—S. P. Hutchinson has been appointed Superintendent of the Pittsburgh Division, succeeding T. J. English, resigned, effective March 11. A. G. Norton has been appointed Division Engineer of the Wheeling Division, with headquarters at Wheeling, W. Va.

Benwood & Wheeling Connecting.—F. H. Crockard has been appointed General Manager, with headquarters at Wheeling, W. Va., succeeding E. L. Wiles.

Bessemer & Southwestern.—J. W. Thornton has been appointed Auditor, succeeding W. H. Flint.

Burlington, Cedar Rapids & Northern.—F. W. Walters has been appointed Division Superintendent, with headquarters at Cedar Rapids, Iowa, succeeding G. A. Goodell.

Canadian Pacific.—T. Williams, heretofore General Superintendent of the Lake Superior Division, has been appointed Superintendent of lines south of the St. Lawrence River, with headquarters at Farnham, Que. R. R. Jamieson, heretofore Division Superintendent at Farnham of the Eastern Division, has been appointed Division Superintendent of the Western Division, with headquarters at Cranbrook, B. C., succeeding G. J. Bury.

Central New England.—William C. Ennis has been appointed Master Mechanic, with headquarters at Hartford, succeeding A. B. Phillips, resigned, effective March 15.

Chesapeake & Ohio.—H. C. Boughton, heretofore General Agent of the Greenbrier Division, has been appointed Division Superintendent, with headquarters at Ashland, Ky., succeeding G. W. Lewis, resigned. H. Pierce, heretofore Resident Engineer, succeeds Mr. Boughton at Ronceverte, W. Va.

Chicago Great Western.—L. L. Smith, heretofore General Shop Foreman at Oelwein, has been appointed Division Master Mechanic, with headquarters at Fort Dodge, Iowa.

Conquista Coal.—The title of E. Ludlow has been changed from General Superintendent to General Manager.

Delaware, Lackawanna & Western.—R. M. Mitchell, Division Engineer at Hoboken, N. J., will have charge of the Newark Track Elevation through the city of Newark.

Denver & Rio Grande.—J. J. Cotter has been appointed Superintendent of the First Division, with headquarters at Pueblo, Colo.

Eastern of Minnesota.—J. D. Mason, heretofore Principal Assistant Engineer of the Great Northern, has been appointed Chief Engineer of the E. of M., with headquarters at West Superior, Wis. This is a new position recently created.

East Louisiana.—W. M. McCampbell has been appointed Master Mechanic.

Findlay, Fort Wayne & Western.—B. W. Fenton, Superintendent, has resigned.

Galveston, Houston & Henderson.—W. M. Paul has been appointed Master Mechanic, with headquarters at Galveston, Texas.

Georgia Northern.—J. N. Pidcock, Jr., has been elected President.

Gulf & Ship Island.—The headquarters of J. A. Jones, First Vice-President, have been removed from Gulfport, Miss., to Buffalo, N. Y.

Gulf, Colorado & Santa Fe.—J. W. Robins, heretofore Trainmaster of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been appointed Division Superintendent of the G., C. & S. F., with headquarters at Cleburne, Texas, succeeding J. G. Hartigan, resigned. (See St. Louis, Iron Mountain & Southern.)

Hearne & Brazos Valley.—P. A. Gorman has been elected Vice-President and General Manager.

International & Great Northern.—Leroy Trice, Second Vice-President, has been appointed General Manager. G. L. Noble, heretofore Assistant General Superintendent, has been appointed Assistant General Manager. The positions of General Superintendent and Assistant General Superintendent, have been abolished.

Interoceanic of Mexico.—A. L. Buddee has been appointed Chief Accountant (Auditor), with headquarters at Mexico, Mex., succeeding A. Blake, resigned.

Iron.—Samuel Hunt has been elected President and T. D. Rhodes Secretary and Treasurer. W. D. Gray has been appointed Auditor.

Lehigh Valley.—Thomas N. Jarvis has been appointed Assistant General Traffic Manager, with headquarters at 26 Cortlandt street, New York. Frank J. Woulfe succeeds Mr. Jarvis as General Eastern Freight Agent, with headquarters at 355 Broadway, New York.

Mexican Union.—E. M. Rogers has been appointed Chief Engineer.

Nevada-California-Oregon.—C. P. Keyser has been appointed Acting Chief Engineer, succeeding R. M. Hall. G. W. Tompkins has been appointed Superintendent of Motive Power, succeeding E. J. Valley, resigned.

New York Central & Hudson River.—W. H. Beck has been appointed Resident Engineer of the Eastern Division, with headquarters at New York City. E. L. Hurley becomes Resident Engineer of the River Division at Weehawken, N. J.

New York, New Haven & Hartford.—W. H. White will, until further notice, assume the duties of Purchasing Agent with the title of Acting Purchasing Agent, succeeding Henry A. Bishop, resigned.

Norfolk & Western.—Henry Fink has been elected Chairman of the Board and is succeeded as President by F. J. Kimball, heretofore Chairman of the Board. L. E. Johnson will, in addition to his duties as General Manager, assume the duties of Vice-President.

Rio Grande Southern.—W. D. Lee, heretofore Assistant Division Superintendent of the Denver & Rio Grande, has been appointed Superintendent of the R. G. S.

St. Louis, Iron Mountain & Southern.—J. G. Hartigan, heretofore Division Superintendent of the Gulf, Colorado & Santa Fe, has been appointed Division Superintendent of the St. L., I. M. & S., with headquarters at Little Rock, Ark., succeeding W. J. McKee, resigned.

St. Louis, Kennett & Southern.—The headquarters of A. R. Ponder, Superintendent, have been removed from Kennett, Mo., to Cape Girardeau, Mo.

San Pedro, Los Angeles & Salt Lake.—A. R. Oster has been appointed Division Superintendent, succeeding E. M. Jessup, assigned to other duties. R. K. Brown has been appointed Engineer Maintenance of Way.

Santa Fe Pacific.—S. P. Barnes has been appointed Division Master Mechanic, with headquarters at Albuquerque, N. Mex.

Seaboard Air Line.—O. G. Cheatham has been appointed Master Mechanic, with headquarters at Fernandina, Fla., succeeding the late Mr. Burton.

Southern.—Wm. Daves has been appointed Inspector of Block and Interlocking Signals, with headquarters at Alexandria, Va.

Wisconsin Central.—R. M. Jacks, heretofore Trainmaster, has been appointed Assistant Division Superintendent, with headquarters at Fond du Lac, Wis.

GENERAL RAILROAD NEWS.

CHESAPEAKE & OHIO.—Application has been made to the New York Stock Exchange for authority to list additional general mortgage 4½ per cent. gold coupon 90-year bonds to the extent of $4,022,000.

CINCINNATI, NEW ORLEANS & TEXAS PACIFIC.—In accordance with a recent vote of the directors, $3,000,000 preferred stock is to be issued, with dividends not to exceed 5 per cent. cumulative, and without voting power, but having prior rights in the event of the distribution of assets. It is intended to reserve $1,000,000 of this for future needs of the company, and to apply $2,000,000 at once for improvements and betterments of the line under the terms of the extension of the lease. This stock is to be issued to holders of common stock pro rata, at par.

GREAT EASTERN.—This line in North Carolina, which is part of a system projected from the mountains to the coast, but which was intended to be built for the present between Fremont and Snow Hill in Green County, 20 miles, is advertised for sale May 5. When the grading of the line was partly done, the road went into the hands of a receiver.

HUNTINGTON LINES.—The Huntington Syndicate, which controls the Pacific Electric R. R. Co., and a number of other electric lines on the Pacific coast, has created a bonded indebtedness of $10,000,000 at 5 per cent. interest, to provide funds for the purchase of all the property of the Los Angeles & Pasadena Co., valued at $1,000,000, the property of the Pasadena & Mt. Lowe Co., and the East Ninth street line of the Los Angeles Ry. Co., valued at $20,358. The remainder of the issue is to be applied to new building and betterment of existing lines, and for acquisition of other property; also rolling stock, shops, machinery, etc. The Union Trust Co., of San Francisco, is trustee.

LOUISVILLE & NASHVILLE.—Application has been made to the New York Stock Exchange for authority to list additional unified 50-year 4 per cent. gold bonds to the extent of $882,000.

MONTGOMERY TERMINAL (ALABAMA).—The property of this company was sold under foreclosure at auction by the bondholders Feb. 28. $260,000 of bonds have been issued and the price was $68,000. The property, which is in the heart of the city, was formerly occupied by the Georgia & Alabama as a freight depot, and was bought by a local syndicate.

ORANGE & NORTHWESTERN.—A special meeting of stockholders was called at Orange, Texas, March 10, to authorize the directors to apply to the State Railroad Commission for authority to issue bonds and to further increase the capital stock to the amount of $280,000. This is to cover the cost of an extension in Orange County, Texas, about five miles long, which also came up before the stockholders, an extension from a point at or near where the main line crosses the western boundary at Jasper County to Marshall, 150 miles, and an extension from Buena, Jasper County, northwest through Jasper, Angelina, Trinity, Houston, Anderson, Freestone and Navarro counties to Corsicana, about 195 miles.

UNION TRACTION OF PHILADELPHIA.—At a meeting of the directors, on March 3, resolutions were passed recommending the acceptance of the offer of John M. Mack and others to lease the road to the Consolidated Traction Co. This is to be a new company, with $30,000,000 capital stock, which will guarantee 3 per cent. on its stock for the first two years, 4 per cent. the third and fourth years, 5 per cent. the fifth and sixth years and 6 per cent. for the seventh year, and for the remaining 992 years of the lease, and will also pay all fixed charges of the underlying companies, including rents, interest and taxes of every kind now assessed or hereafter to be assessed. The holdings of the new consolidated company will include all the stock of 13 companies which obtained franchises from the City Council in June, 1901, and new lines are to be built at once on these. The stockholders of the Union Traction Co. will have the privilege of subscribing for one share of the stock of the new company for each four shares of their present holdings, the remainder of the stock to be taken up by the Mack syndicate. A special meeting of the stockholders has been called for May 5, to vote on this lease.

WHEELING & LAKE ERIE.—This company has made application to the New York Stock Exchange to list additional first and second preferred stock to the extent of $847,500 first preferred, and $423,800 second preferred.